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Editorial

Preoperative laboratory and diagnostic testing: cost vs. value

Bernard V. Wetchler

The more experience we have gained in providing compacted perioperative care to the ambulatory surgery patient; the more experience we have gained in balancing excellence of care with cost containment constraint; the more we are realizing what we once took for granted, the need for and the importance of a physician's thorough history and physical examination in advance of the scheduled day of surgery.

A quarter century ago, ambulatory surgery was championed as being more convenient for patients and physicians, and more cost efficient than a traditional hospital stay while maintaining a comparable level of patient safety. As outcomes began to support these premises, we became more cavalier, and began to place greater reliance upon a battery of screening tests to evaluate our patients and less upon the physician's examination. Final clearance to proceed was often made on the day of surgery when the anesthesiologist reviewed data and performed an evaluation. We are now beginning to realize this attempt at expediting the evaluation process has subtracted both costly operating theatre inefficiencies (i.e. last minute delays, postponements, cancellations) and the expense of what many consider unnecessary testing, from the cost savings attributed to ambulatory surgery.

The cost versus the value of preoperative laboratory and diagnostic tests is fast becoming one of the most discussed cost containment issues in ambulatory surgical care. The system of testing by previously established protocol evolved from the mistaken belief that the more information, regardless of relevance, added to patient safety and reduced physician liability for any adverse events [1]. Testing by protocol, although a more costly alternative to selective testing based upon a patient specific profile, relieved the physician of both the time required and the decision making that would be a part of a thorough history and physical examination.

Evaluating a patient in advance of a procedure can reduce the cost of unnecessary testing while decreasing operating room inefficiencies. Data support the concept that a thorough medical history and the physician deciding whether there is need for further evaluation of the patient's health status can reduce costs [2]. The American Society of Anesthesiologists (ASA) supports the concept that 'no routine laboratory or diagnostic screening test is necessary for the preanesthetic evaluation of patients.' If legal requirements (government or hospital) exist regarding preoperative testing these should be observed even though current practice may dictate otherwise. For ASA PS1 and 2 patients, it can be argued that no laboratory or diagnostic testing is required. For patients with medical problems, tests should be organ or disease specific (i.e. pulmonary, cardiac, etc.) [3]. The lack of value of screening tests without specific clinical indicators has been well established [2]. In the USA, annual estimates for the cost associated with unnecessary testing approximates four billion dollars.

A preoperative assessment clinic (Stanford University Medical Center, Stanford, California, USA) under the direction of the department of anesthesiology, now evaluates patients several days in advance of surgery. A one-year review of the effectiveness of such a program revealed: an 88% decrease in day of surgery cancellation, a $112 per patient decrease in testing costs; a significant decrease in internal medicine, pulmonology and cardiology consultations [4]. Preoperative evaluation is now gaining recognition as an area of importance in its own right.

Testing by protocol has run its course, it needs to be changed, and in fact is changing. A return to physician decision making based upon a thorough history and physical examination must replace predetermined testing protocols. Physicians and the facilities in which they provide care must address cost versus value of patient specific preoperative testing and the impact, if any, on patient safety.

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Review article

Pain management after ambulatory surgery

Girish P. Joshi *

Department of Anesthesiology and Pain Management, University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Boulevard, Dallas, TX 75235-9068, USA

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Abstract

Numerous studies have reported inadequate pain management after ambulatory surgery. Uncontrolled pain is associated with increased incidence of nausea, anxiety and delirium, prolonged postanesthesia care unit stay, delayed discharge from ambulatory facility, unanticipated hospital admissions and delayed resumption of normal activities. The management of pain after ambulatory surgery poses unique challenges because of the need to balance pain relief with concerns of side effects ans safety. The goal of pain management should be to minimize pain, not only at rest but also during mobilization. Preoperative education of patients regarding the modalities of pain treatment, the pain assessment tools and the degree of pain that they might expect is an important part of pain management. The preemptive and multimodal techniques provide more effective analgersia with reduced incidence of side effects. Local anesthetic techniques should be utilized whenever possible as they are simple, have a high success rate and a low incidence of compilations. Local anesthetic techniques administered before the initiation of the surgery may decrease anesthetic requirements, provide for an earlier recovery and decrease postoperative analgesic requirements. Nonsteroidal antiinflammatory drugs have opioid-sparing effects, which may reduce the incidence of opioid-related side effects. Pain after discharge from the ambulatory facility should be controlled with regular dosing with oral nonsteroidal antiiflammatory drugs and opioid analgesic combination. Oral medications should be administered as early as possible and before the reduction of analgesic effects of parenterally adminisitered drugs. It is important that oral medications are administered at regular intervals rather than on an 'as needed' basis. Regular dosing with pain medications provides superior analgesia as this prevents pain from becoming severe and decreases the incidence of breakthrough pain. Finally, adequate and appropriate application of currently available information and therapies would significantly improve postoperative pain management.

Keywords: Ambulatory surgery; Postoperative pain management; Analgesics; Opioids; Nonsteroidal anti-inflammatory drugs; Local anesthetics

1. Introduction

Currently, ambulatory surgery constitutes more than 60% of all surgery performed in the USA. Furthermore, there is an increasing trend towards performing more extensive and potentially more painful surgical procedures on an ambulatory basis. However, one of the most important factors limiting the growth of ambulatory surgery is our ability to provide adequate postoperative pain relief. This has increased interest in finding more effective pain management techniques after ambulatory surgery [1]. Although there is an increased awareness of the importance of effective pain management after ambulatory surgery, numerous clinical studies indicate that postoperative pain is not always effectively treated [2,3]. A study evaluating the quality and severity of pain in patients undergoing ambulatory

* Tel.: +1 214 5907259; fax: +1 214 5906945; e-mail: girish.joshi@email.swmed.edu

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surgery reported that 35% of patients experienced moderate-to-severe pain at home in spite of analgesic medication [2].

Inadequate treatment of pain may be due to lack of knowledge and skills or attitudes of healthcare personnel. In addition, pharmacokinetic and pharmacodynamic variability among patients and variability in the patient's perception of pain are important factors resulting in inadequate pain relief. An important reason for inappropriate pain management is inadequate or improper application of available information and therapies. Outpatients undergoing day-case procedures require an analgesic technique that is effective, has minimal side effects, is intrinsically safe, and can be easily managed away from the hospital or surgery center.

2. Consequences of inadequate pain management

The harmful pathophysiological and psychological consequences of unrelieved pain are well-recognized [4]. Uncontrolled pain is associated with increased incidence of: postoperative nausea [5], postoperative delirium [6], prolonged postanesthesia care unit (PACU) stay [3], delayed discharge from an ambulatory facility [7], and unanticipated hospital admissions [3,8]. Furthermore, inadequate pain control may delay resumption of normal activities. Importantly, postoperative patient satisfaction has been shown to be related to the level of pain intensity [9]. In a survey of ambulatory surgery patients, the presence of postoperative symptoms including pain significantly contributed to dissatisfaction with their surgical experience [10]. Patient satisfaction is a major determinant of the success of ambulatory surgery and is among the most important outcomes that can be influenced by adequate pain management. Importantly, in the current atmosphere of managed care, increasing attention has been given to the assessment of patient satisfaction as a way to monitor quality of care in the hospital setting.

3. New concepts in acute pain management

Recent advances in the pathophysiology of acute pain have improved our ability to manage postoperative pain. Laboratory and clinical studies have shown that injury produces prolonged change in the central nervous system function that influences responses to subsequent afferent input [11,12]. Therefore, blockade of afferent input before the surgical stimulation may eliminate central sensitization and prevent amplification and prolongation of postoperative pain. Preoperative administration of opioid or nonopioid analgesics (nonsteroidal anti-inflammatory drugs (NSAID) and local anesthetics) may reduce the degree of pain and the need for analgesics in the postoperative period. This is termed as 'preemptive' analgesia. Two recently published articles have critically reviewed clinical studies related to the preemptive effects of analgesic treatments [11,12].

It has been increasingly apparent that the effectiveness of an individual analgesic may be enhanced by the additive or synergistic effects of multiple analgesic drugs that have different mechanisms of analgesia. The 'multimodal' analgesia techniques consisting of a combination of analgesic regimens including opioids, NSAID, and local anesthetics have assumed increasing importance in the management of postoperative pain. Combining modalities provides more effective analgesia with a reduced incidence of side effects [13].

The demonstration of an increased number of opioid receptors on peripheral nerve terminals in the postinflammatory state has led to the concept of peripheral analgesia [14]. It has been recognized that opioid nociception can be achieved by activation of peripheral opioid receptors. Peripheral administration of smaller, systemically inactive doses of opioids has been reported to provide effective and prolonged analgesia. Effective peripheral antinociception has several advantages, including the need for lower total opioid doses and reduced opioid-related side effects. Many investigators have used an arthroscopic model to evaluate the peripheral analgesic properties of opioids and nonopioid analgesics.

4. Surgical considerations

One of the major considerations in selection of a surgical procedure to be performed on an outpatient basis is the expected degree of postoperative pain associated with the surgery [15]. A study evaluating the pattern of pain after ambulatory surgery found that the type of surgery was a significant predictor of severity of postoperative pain [3]. Almost 50% of patients reporting 24-h postoperative pain had undergone laparoscopic, orthopedic or a urologic procedure. In addition, severe pain was associated with increased duration of surgery.

A reduction in surgical trauma by minimally invasive surgery should reduce the stress response to surgery including postoperative pain and thus facilitate early recovery [16]. Minimally invasive surgery including laparoscopic surgery is one of the rapidly expanding fields of surgery. The major reasons for increased use of laparoscopic procedures include decreased pain, smaller incisions, and decreased length of hospital stay. However, pain after laparoscopic procedures (particularly cholecystectomy) can sometimes be severe and may last for several days [17]. The type of pain after laparo-

scopic procedures differs considerably from that observed after open procedures. Laparotomy results mainly in parietal pain (from the abdominal wall), while laparoscopy causes more visceral pain [18]. In addition, the degree of stretching of the intraabdominal cavity is an important source of postoperative pain. Higher insufflation pressures significantly increase the severity of postoperative pain [19]. Subphrenic and shoulder pain after laparoscopic procedures appears to arise from diaphragmatic and phrenic nerve irritation due to insufflated carbon dioxide. This pain tends to be aggravated by ambulation and may persist for several days after surgery.

It is suggested that pain after laparoscopic tubal ligation is more severe than that after diagnostic laparoscopy [20,21]. The deep pelvic pain after tubal ligation might be due to tubal spasm following their occlusion [20] or due to uterine contractions resulting from prostaglandin release secondary to tubal trauma and ischemia [22]. In patients undergoing open hernia repair, the postoperative pain is from dissection of the spermatic cord (including the cremasteric muscle and any associated fat) and the suturing of the tissues, sometimes with some tension. During laparoscopic hernia repair, there is relatively little cord manipulation and postoperative pain is probably due to the dissection of parietal peritoneal flap off the abdominal wall.

The morbidity associated with surgical procedures has been steadily decreasing in recent decades due to the specific therapeutic strategies focused to prevent or treat specific outcome variables. However, most of these strategies have been focused on unimodal interventions with surgeons focusing on surgically oriented postoperative complications and anesthesiologists focusing on intraoperative and immediate postoperative complications [16]. It is possible that multimodal interventions may lead to a further reduction in the undesirable sequelae of surgical injury with improved recovery and reduction in postoperative morbidity and overall costs [16]. With respect to perioperative pain management, it is important that both anesthesiologists and surgeons join hands to manage pain as a continuum (i.e. preoperative, intraoperative and postoperative).

5. Preoperative considerations

Preoperative psychological factors, anxiety, fear of surgery and anticipation of pain are important factors which may affect patients' experience of postoperative pain [23]. The first step in the management of perioperative pain, which is commonly overlooked, is preoperative patient education regarding the modalities of pain treatment, the pain assessment tools, and the degree of pain that they might expect. Patients have to be made aware that they should expect adequate pain relief and should communicate their analgesic needs. It is necessary to educate patients that it is preferable not to allow pain to become severe, as it is easier to 'control' pain if it is treated at an early stage.

With an increased focus on the concept of preemptive analgesia, preoperative administration of analgesics has been increasingly employed. Preoperative administration of opioid or nonopioid analgesics has been reported to reduce patient anxiety, perioperative analgesic requirements, and pain scores in the immediate postoperative period [24,25]. However, opioid premedication is controversial in the ambulatory setting because it may increase the incidence of opioid-related side effects and delay recovery. Premedication with oral NSAIDs given 60–90 min prior to surgery can reduce the degree of postoperative pain, analgesic requirements, and discharge times [26–28]. However, efficacy of preoperative NSAIDs is presumably dependent on the type and severity of the surgical procedure.

6. Intraoperative considerations

The influence of the anesthetic technique on postoperative analgesic requirements is an important consideration. Opioids still remain the primary analgesic drugs used to achieve perioperative analgesia. Opioids are commonly administered as a part of a balanced anesthesia technique. The use of an opioid-based general anesthetic technique decreased opioid analgesic requirements during the first 4 h after surgery [29]. A recent study suggested that patients receiving smaller doses of fentanyl when body mass index and duration of anesthesia were taken into consideration had a higher incidence of severe pain in the PACU [3]. Not surprisingly, the need to provide analgesia in the PACU has been increased with the availability of shorter-acting anesthetic and analgesic drugs, leading to a more rapid emergence from anesthesia. Shorter-acting opioids such as remifentanil allow faster postoperative recovery, however, it is important that appropriate longer-acting analgesic techniques are utilized to achieve adequate postoperative pain control [30]. However, aggressive use of opioids can increase the incidence of postoperative nausea, vomiting, sedation, and bladder dysfunction which may delay recovery [31]. In addition, opioids are less effective in relieving the pain associated with physical activity such as coughing and ambulation [31]. Therefore, it may be necessary to reconsider the primary use of opioids for perioperative pain relief [32].

Tverskyy et al. [33] evaluated the effects of the type of anesthesia (i.e. general anesthesia, spinal anesthesia, and local anesthesia) on the degree of postoperative pain. They observed that compared with spinal anesthesia or general anesthesia alone, preincisional inguinal field blocks as an adjunct to general anesthesia was

associated with lower pain scores and a longer time to first analgesic requirement. In addition, wound tenderness was lower in patients receiving a field block. These results suggest that peripheral nerve blockade may have a higher efficacy in preventing central hyperexcitability as compared with central blockade.

7. Local anesthetic techniques

Local anesthetic techniques are simple, have a high success rate and a low incidence of complications. Furthermore, epinephrine added to the local anesthetic solution decreases capillary oozing and reduces the risk of postoperative reactionary hemorrhage. When used as adjuvants to general anesthesia, these techniques decrease the intraoperative anesthetic and analgesic requirements and provide for a rapid and smooth recovery. In addition, local anesthetic techniques can be utilized to modulate peripheral mechanisms of nociception and reduce the response to surgical injury (i.e. provide preemptive analgesia). Although the potential benefits of using local anesthetic techniques for postoperative pain relief have been well-recognized, they are under utilized.

Wound infiltration can provide excellent analgesia that may outlast the duration of action of the local anesthetic [34]. Different methods of administration, such as instillation [35–37] or aerosol application [38] of local anesthetics in the surgical wound have also been shown to provide long-lasting analgesia, reduce postoperative analgesic requirements, and facilitate earlier mobilization. The duration of analgesia can be further increased by infusion of local anesthetics through a catheter placed in the layers of the skin [39,40]. Yndgaard et al. [41] reported that subfascial injection of local anesthetics resulted in more effective pain relief when compared with subcutaneous administration. Similarly, injection of local anesthetic at the parietal peritoneum (versus subcutaneous infiltration) provided more reduction in pain scores [42]. This may suggest that pain stimuli are generated primarily in the subfascial layers, rather than the subcutaneous layers. Therefore, it is important that the local anesthetic solution is administered in the appropriate tissue plane.

In patients undergoing laparoscopic tubal ligation procedures, mesosalpingeal infiltration or topical application of local anesthetic directly to the Fallopian tubes has been shown to significantly reduce postoperative pain and cramping [43–45]. Another simple and effective method of reducing the intensity of postlaparoscopic pain is intraperitoneal instillation of local anesthetic drugs. Recent studies have reported significant pain relief after laparoscopic cholecystectomy when 15–20 ml bupivacaine 0.5% with or without epinephrine was administered before and after surgery into the hepatodiaphragmatic space, near and above the hepatoduodenal ligament and above the gallbladder or gallbladder bed [46,47]. No side effects from bupivacaine 150–200 mg with or without epinephrine were observed. On the other hand, high volumes of local anesthetics in lower concentrations did not provide significant pain relief. It is possible that concentration and the timing of local anesthetic administration are important with this technique of pain relief.

Intraarticular administration of local anesthetics following arthroscopic knee surgery has been shown to reduce postoperative analgesic requirements and facilitate early mobilization and recovery [48]. Although the plasma bupivacaine concentrations after intraarticular instillation of 25–40 ml 0.5% bupivacaine were within a safe range [49,50], some investigators have recommended the addition of epinephrine [51]. With the acceptance of peripheral analgesia, an increasing number of studies have reported the analgesic effects of intraarticularly administered morphine [52]. The dose and volume of morphine injected and the interval between intraarticular injection and tourniquet release are important factors in the success of the intraarticular technique [53]. Intra-articular administration of morphine 5 mg in 25–30 ml dilution provides effective analgesia and decreases analgesic requirements after arthroscopic knee surgery [54,55]. Since local anesthetic agents have a rapid onset of action, there is the possibility that a combination of morphine and bupivacaine would provide for analgesia of an early onset and long duration.

Similar to local anesthetic infiltration or instillation, peripheral nerve blocks are highly effective in reducing anesthetic and analgesic requirements in patients undergoing ambulatory surgery. In patients undergoing inguinal hernia repair, ilioinguinal and iliohypogastric nerves block have been shown to decrease postoperative pain and analgesic requirements [56]. In patients undergoing long saphenous vein stripping surgery, femoral and genitofemoral nerve blocks were associated with faster recovery, lower incidence of postoperative pain, backache, headache, and better patient satisfaction as compared with spinal anesthesia [57].

Orthopedic surgical procedures have been shown to be associated with significant postoperative pain. Therefore, utilization of local anesthetic techniques may be highly beneficial in allowing early ambulation and return to normal function. Shoulder arthroscopy performed under the brachial plexus block using the interscalene approach was found to be safe and effective with shorter hospital stays and fewer overnight hospitalizations [58]. The suprascapular nerve provides sensory fibers to 70% of the shoulder joint, including the superior and posterosuperior regions of the shoulder joint, capsule, and variably the overlying skin [59]. Suprascapular nerve block has been shown to provide

excellent pain relief in shoulder pain disorders [60]. Therefore, suprascapular nerve block may offer a safe alternative to interscalene nerve block. Richie et al. [61] evaluated the efficacy of suprascapular nerve block on the degree of pain and morphine consumption after arthroscopic shoulder surgery. They observed that suprascapular nerve block using 10 ml 0.5% bupivacaine with 1:200000 epinephrine before induction of general anesthesia reduced visual analog and verbal pain scores, as well as decreased the usage of morphine and the incidence of postoperative nausea in the immediate postoperative period and 24-h after surgery. In addition, the duration of hospital stay was also reduced. Because of its efficacy and safety, these authors recommend routine use of suprascapular nerve block as a supplement to general anesthesia in ambulatory shoulder arthroscopic surgery.

With increasing acceptance of the concept of preemptive analgesia, a number of investigators have evaluated the efficacy of local anesthetic blockade prior to surgical incision. Preincisional wound infiltration with lidocaine 1%, 40 ml, was a more effective method of providing postoperative analgesia than infiltration of the wound after inguinal hernia repair [62]. In contrast, other investigators have not found significant differences in pain scores and analgesic requirements between patients who received field block either before or after surgery [63].

Significant pain relief with a lower incidence of side effects can be achieved with the use of multimodal analgesia techniques. Eriksson et al. [64] reported that the application of 5 ml lidocaine gel on the sterilization clips and perioperative administration of ketoprofen 200 mg i.v. provided superior pain relief with reduced analgesic requirements and lower incidence of postoperative nausea and vomiting as compared with the use of local anesthetic or ketoprofen alone. In patients undergoing laparoscopic cholecystectomy, intramuscular administration of meperidine 0.6 mg/kg and ketorolac 0.5 mg/kg prior to induction of anesthesia combined with local anesthetic infiltration into the skin prior to surgical incision was highly effective in relieving postoperative pain and resulted in faster recovery and discharge [65]. Similarly, a combination of field block with bupivacaine and oral papaveretum–aspirin provided superior analgesia compared with either field block or oral papaveretum–aspirin alone [66].

Because of its long duration of action, bupivacaine is the most commonly used local anesthetic to provide postoperative pain relief. Ropivacaine is a new aminoamide local anesthetic with less potential to depress myocardial contractility and conduction and is reported to have a greater sensory-motor separation property. Thus, it may provide superior sensory blockade without the motor blockade. However, no difference in the duration of analgesia was demonstrated between bupivacaine and ropivacaine [67].

An important limitation in the use of local anesthetic techniques when utilized to achieve postoperative pain relief is the short duration of action of the presently available local anesthetic drugs which may lead to an increased perception of pain after the recovery from the neural blockade. Although continuous irrigation of the surgical wound may provide prolonged analgesia, irrigation of all parts of the wound may be technically difficult. In addition, motor blockade might predispose to injury and render postoperative neurological assessment difficult. Availability of longer-acting, slow-release preparations with incorporation of local anesthetics or opioids in liposomes or microspheres, should enhance the efficacy of local anesthetic techniques [68,69]. There is a need for the development of more effective methods for continuous irrigation and to evaluate the efficacy of local anesthetic techniques as a part of multimodal analgesia. Refinement and development of new block techniques and approaches may provide superior postoperative pain relief with improved patient safety. Furthermore, well-designed studies are necessary to clarify the clinical significance of the timing of local anesthetic blockade and the dose and volume of local anesthetics.

8. Nonsteroidal anti-inflammatory drugs

The NSAIDs have become increasingly popular in the management of perioperative pain because of their opioid-sparing effects and increased acceptance of the concept of multimodal analgesia. Of importance, NSAIDs are associated with a lower risk of postoperative nausea and vomiting, thereby improving patient comfort and allowing for an earlier discharge. The analgesic properties of the NSAIDs have been attributed to a decrease in the inflammatory response to surgical trauma and reduced peripheral nociception by inhibition of cyclooxygenase and a decrease in the synthesis of prostaglandins [70]. There are also recent reports describing the central modulation of painful stimuli by NSAIDs [71]. The controversies in the perioperative use of NSAIDs have been recently reviewed [72].

In the ambulatory setting, many studies have reported reduced postoperative pain and opioid requirements with intraoperative or postoperative use of NSAIDs either alone or in combination with opioids [73–75]. However, NSAIDs have a weaker analgesic property as compared with opioids or local anesthetics and also appear to exhibit a ‘ceiling effect’ [76] and therefore, may not provide adequate analgesia when used as sole analgesic. Despite these deficiencies, NSAIDs may decrease the risk of breakthrough pain because of their more prolonged duration of action and are valuable adjuvants when used in combination with

opioids and local anesthetics. Combination of hydrocodone (7.5 mg) and acetaminophen (750 mg) were found to be as effective in the management of pain after arthroscopic surgery as ketorolac (10 mg) orally [77]. The adjunctive use of ketorolac (30 mg) i.v. reduced pain scores and the need for additional analgesics in adult patients undergoing inguinal hernia repair using general anesthesia with field block [78].

Concerns have been raised regarding the side effects of NSAIDs such as gastric irritation, gastrointestinal bleeding, impaired coagulation, and renal dysfunction following their perioperative use [79]. It has been shown that short term use (24–72 h) of NSAIDs do not increase the risk of gastrointestinal side effects, provided the contraindications of these agents such as a history of peptic ulcer disease are observed [80]. Although no significant increase in blood loss have been reported after the use of NSAIDs in the perioperative period [81], they should not be used in patients with preexisting coagulation defect or those undergoing procedures with extensive tissue dissection (e.g. surgery involving skin flaps). Clinically significant renal dysfunction with the use of ketorolac has been reported only in patients with pre-existing renal dysfunction, hypovolemia, cardiac failure, sepsis, cirrhosis of the liver, and use of other nephrotoxic drugs [81]. Recent studies have reported that ketorolac administered for 5 days or less did not increase the incidence of acute renal failure or gastrointestinal and operative site bleeding [82,83]. Finally, NSAIDs should be used with caution in clinical situations where prostaglandins have proven therapeutic benefits, such as circulatory insufficiency, myocardial ischemia, and coronary vasospasm [84].

9. Immediate postoperative considerations

Adequate postoperative analgesia without side effects is necessary to facilitate discharge after outpatient surgery. Pain in the PACU should be treated quickly and effectively with small doses of potent, rapidly acting opioid analgesics. Fentanyl has a faster onset time, and its use may provide more rapid pain control and avoid unnecessary extra doses of opioids which may be administered when a drug of slower onset (i.e. morphine) is used. Claxton et al. [85] compared the analgesic efficacy and the incidence of opioid-related side effects of equipotent doses of morphine (1–2 mg) and fentanyl (12.5–25 μg) repeated every 5 min. These authors concluded that morphine and fentanyl in equipotent doses are comparable in treating postoperative pain in the PACU. However, the regimen did not provide rapid analgesia, as it took 20 min to achieve a significant decrease in baseline pain scores and 40 min to achieve VAS pain scores of less than 40 mm. Morphine provided more sustained analgesia than fentanyl, but it was associated with a higher incidence of nausea and vomiting after discharge home [85]. On the other hand, patients receiving fentanyl required additional oral analgesia during phase II recovery (i.e. after discharge from the PACU but before discharge home). Therefore, these authors suggested that if fentanyl is used to provide analgesia in the PACU, oral analgesics should be administered as supplements to provide more prolonged pain relief.

10. Pain control after discharge from the ambulatory facility

Oral opioids or NSAIDs either alone or in combination are frequently used to provide postoperative pain relief at home. The rapid recovery associated with the availability of short-acting anesthetic drugs make it possible for patients to tolerate oral medications in the early postoperative period. Oral medications should be administered as early as possible, and before the reduction of analgesic effects of parenterally administered drugs. It is important that oral medications are administered at fixed intervals rather than on an 'as needed' basis. Regular dosing with pain medications provides superior analgesia as this prevents the pain from becoming severe and decreases the incidence of breakthrough pain. Recently Litman et al. [86] reported the successful use of oral patient-controlled analgesia by placing a limited number of analgesic tablets by the patients' bedside and giving them some degree of independence and self-control over their postoperative treatment.

When used orally, larger doses of opioids are required to achieve comparable analgesic effects because of the extensive hepatic metabolism also known as the 'first pass' effect. Codeine and its derivatives are the most commonly used oral opioid analgesics after ambulatory surgery. Compared to morphine, codeine and its derivatives have a higher oral bioavailability. Oxycodone and hydrocodone are orally active derivatives of codeine with higher analgesic potency. Controlled release preparations of oxycodone have a longer duration of action and less side effects than the older formulations and have been shown to be effective postoperatively [87]. Controlled-release preparations should provide superior pain relief because they allow greater convenience, improve patient compliance, and provide uninterrupted nighttime sleep.

Mild to moderate postoperative pain can be treated with oral combinations of opioids with NSAIDs that may prove more effective than either drug alone and may reduce their side effects. In addition, the use of NSAIDs with opioids may reduce healthcare costs by decreasing the costs associated with opioid therapy and opioid-related side effects [31,88]. However, unaccept-

able adverse effects of high doses of NSAIDs may limit their daily analgesic dose. Therefore, use of NSAIDs and opioid combination during the daytime and controlled-release formulations of opioids for the night may provide more cost-effective analgesia.

11. Noninvasive techniques

In recent years, there has been an increased interest in noninvasive approaches for administering analgesics because of their potential benefits in the management of pain following ambulatory surgery. Investigators have evaluated the use of oral transmucosal fentanyl [89], transnasal sufentanil, fentanyl, and meperidine [90–92], transdermal fentanyl and sufentanil [93,94], and morphine iontophoresis [95]. These alternative methods of opioid administration are simple, easily accessible, avoid the first-pass hepatic drug metabolism and provide for a rapid onset of action.

Development of a spray bottle with safety measures similar to a patient-controlled analgesia device may be used to self-administer opioids nasally. A recent study reported that patient-controlled intranasal analgesia using fentanyl provided postoperative pain relief as effective as intravenous patient-controlled analgesia [96]. A patient-controlled analgesia system using iontophoresis of opioids may also provide effective analgesia and would be advantageous in ambulatory patients. However, there is the potential for an increase in opioid-related side effects. Therefore, the role of these analgesic techniques in the outpatient setting remains to be investigated.

12. Non-pharmacologic techniques

In recent years there has been an increasing interest in the management of pain using non-pharmacological techniques because they avoid the side effects produced by opioid and non-opioid analgesics and, thus, may be beneficial for ambulatory surgery. These techniques include cognitive behavioral strategies such as relaxation and distraction therapy, preparatory information, or positive reinforcement and physical strategies such as the application of heat or cold, massage, exercise, rest, or immobilization. Other non-pharmacological approaches such as transcutaneous electric nerve stimulation (TENS), acupuncture, acupuncture-like transcutaneous electric nerve stimulation (ALTENS), and percutaneous electrical nerve stimulation (PENS) have also been used for treatment of postoperative pain. Although these non-pharmacologic techniques have convincing theoretical bases, their clinical efficacy remains to be proven [1]. Furthermore, these non-pharmacologic techniques may not be efficacious as sole strategies and should be utilized only in combination with pharmacologic treatment. These techniques are encouraged in the clinical practice guidelines proposed by the Agency for Health Care Policy and Research. To improve the efficacy of these techniques, it is necessary that they are discussed with the patients preoperatively.

13. Future considerations

Numerous studies are investigating novel techniques to provide effective pain relief with minimal side effects. New interest has been focused on the peripheral treatment of surgical wounds and controlling the local inflammatory response to minimize postoperative pain. Intraoperative infusion of low-dose adenosine has shown to reduce anesthetic requirements, decrease the need for analgesics, and reduce pain scores in the postoperative period [97]. Multimodal analgesic regimens with combinations of opioids, NSAIDs, α_2-adrenergic antagonists, and *N*-methyl-D-aspartate receptor antagonists (e.g. ketamine) are being investigated. Similar to the peripheral effects of opioids, the analgesic efficacy of intraarticular administration of NSAIDs have also been investigated. Ketorolac 60 mg when administered along with bupivacaine 0.25% through the intraarticular route provided significant analgesia after knee arthroscopy [98]. Intraarticular tenoxicam (20 mg) (NSAID) reduced oral analgesic requirements during the first day after knee arthroscopy but did not alter patient's perception of pain [99]. However, one of the concerns with the use of intraarticular NSAIDs is the possibility of reduction in chondrocyte biosynthesis and cartilage destruction [100].

Recent experimental studies report that cholinergic systems can modulate pain perception and transmission. Neostigmine, an anticholinergic drug, can cause hyperpolarization of neurons, reduction in the release of pronociceptive neurotransmitters, or activation of the nitric oxide–cyclic guanosine monophosphate pathway and thereby, might provide peripheral antinociception by elevating endogenous acetylcholine. Intraarticular administration of neostigmine (500 μg) has been reported to reduce pain scores and time to first use of analgesics [101].

Improvements in the patient-controlled analgesia techniques and availability of smaller non-electronic on demand delivery systems may facilitate pain management with parenteral analgesics in the ambulatory setting. The subcutaneous route of patient-controlled analgesia (SC-PCA) administration may be a practical alternative to the intravenous route in the treatment of postoperative pain following ambulatory surgery because maintenance of intravenous access is not required. Continuous subcutaneous infusion or SC-PCA has been evaluated with morphine, hydromorphone,

and oxymorphone [102]. Use of SC-PCA with morphine following outpatient hemorrhoidectomy provided effective pain control, had high patient acceptance, and was cost-effective [103]. Recently, Rawal et al. [104] reported effective pain relief after outpatient surgical procedures with self-administration of local anesthetic solution using a elastometric balloon pump used at home. The efficacy and safety of the patient-controlled analgesia techniques depends upon proper programming of these devices and improved education of patients so that they are able to use the therapy in a rational manner. The role of these analgesic techniques in the outpatient setting needs to be clarified by further investigation and clinical experience with focus on patient outcome and cost-effective related issues.

With increased stress on multimodal interventions, the importance of the treatment of multiple causes of postoperative pain has been emphasized. It has been suggested that infection of hemorrhoidectomy wounds may influence postoperative pain and analgesic requirement through inflammatory swelling and edema. Administration of metronidazole in patients undergoing day case hemorrhoidectomy has been shown to decrease the degree of postoperative pain on days 5–7, increase patient satisfaction and allow for an earlier return to work [105]. A recent study reported that administration of an antispasmodic drug such as glycopyrrolate (0.3 mg) i.v. at induction of anesthesia significantly reduced pain scores in the immediate postoperative period, decreased the requirements for analgesics, and improved the quality of recovery after day-case laparoscopic sterilization using clips [106].

14. Summary

Despite substantial advances in our understanding of the pathophysiology of acute pain and the availability of newer opioid and non-opioid analgesics, as well as new techniques of drug administration, postoperative pain after ambulatory surgery is not always effectively treated. The goal of pain management should be to minimize pain, not only at rest but also during mobilization. Furthermore, there should be an increased focus on the prevention of breakthrough pain which may occur after the patient has left the ambulatory facility. Pain management is a dynamic process which includes frequent patient assessments and adjustments of the analgesic regimen, and knowledgeable treatment of the side effects. The management of pain after ambulatory surgery poses some unique challenges. The most important task for practitioners is the ability to balance pain relief with concerns about safety and side effects. Importantly, adequate and appropriate application of currently available information and therapies would significantly improve postoperative pain management.

There should be an increased emphasis on multimodal techniques of providing analgesia. Local anesthetic techniques should be utilized whenever possible because they not only decrease the requirements for anesthetic agents and provide for an earlier recovery but also decrease the analgesic requirements in the postoperative period. Despite the relatively short duration of action of local anesthetic techniques, they reduce pain in the immediate postoperative period until it can be controlled with oral analgesics. Pain after discharge from the ambulatory facility should be controlled with regular dosing with oral NSAID–opioid analgesic combinations which should avoid the occurrence of breakthrough pain and provide for superior analgesia. Well-designed studies evaluating the cost-effectiveness of various analgesic techniques are necessary to assist practitioners in decision-making.

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Ambulatory Surgery

Ambulatory surgery in abdominal wall pathology: 7 years experience

León Herszage *, Leonardo L. Dimasi, Jose A. Abait, Omar P.A. Damia, Pablo Giuseppucci, Claudia B. Mitru, General Surgery Residency of Pirovano Hospital

General Surgery Department, General Municipal Pirovano Hospital, Buenos Aires, Argentina

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Abstract

We present 2100 cases of abdominal wall pathology operated on under local anesthesia, in an ambulatory setting during the last 7 years. The pathology involved included: inguinal hernias (70%), umbilical hernias (8%) epigastric hernias (6%), ventrolateral hernias (1.6%), incisional hernias. (13.5%), abdominal wall tumors (0.5%), and tumors of the spermatic cord or round ligament, (0.4%). All the patients went out of the operating room walking on their own, and immediately returned to their usual activities, with no hospital stay at all. We found in our series seven important complications (0.3%), three wound infections, two atrophic testicles, a seroma and a hematoma. We emphasize the simplicity of the method and the patient's immediate ambulation, based on experimental works in healing and immunology.

Keywords: Ambulatory surgery; Hernia; Incisional hernia

1. Introduction

Available research on healing and immunology in molecular biology [2,4–9,11] encouraged us to start a program of ambulatory surgery for any kind of abdominal wall pathology. A smooth post-operative course, low morbidity and developing a simple protocol have been, and are our aims.

2. Methods

A total of 2100 ambulatory operations were performed between June 1990 and May 1997 (70% of all abdominal wall pathology). The ages ranged from 13 to 96 years. Patients were selected according to the type of pathology (size and importance of the lesion and procedure to be performed), and their level of understanding, attitude and acceptance, bearing in mind that patients remained conscious, awake and aware throughout the whole of their operations.

All operations were classified as follows (numbers in percent):

Inguinal hernias	70.0
Umbilical hernias	8.0
Epigastric hernias	6.0
Incisional hernias	13.5
Wall tumors	0.5
Ventrolateral hernias	1.6
Tumors of the spermatic cord and round ligament	0.4

The most common surgical techniques used for the repairs were:

(1) In groin hernias: Marcy, Madden, Shouldice two layer—Nyhus, Barroetaveña, Acevedo, Wantz, Bendavid, Lichtenstein plug and McEvedy Ogilvie procedures for femoral hernias, -prosthetic repairs either by anterior or posterior approach, Lichtenstein and Gilbert free tension techniques.

* Corresponding author. Fax.: +541 372-9632; e-mail: herszage herszage@intramed.net.ar, herszage herszage@yahoo.com

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(2) In ventrolateral, epigastric, subcostal and incisional hernias: anatomic repair techniques, Morestin, Mayo, procedures, and meshes with or without relaxing incisions.

Routine preoperative studies were obtained in all cases. Preoperatively, patients were admitted to a waiting room in the hospital. Afterwards, they were taken to the operating theatre where they were administered intravenous solutions and a unique antibiotic course through a catheter placed percutaneously into a peripheral vein. Patients were connected to a cardiac monitor and an oximeter, No anesthesiologist routinely took part in the procedures. Only in high risk cardiac cases was monitoring performed by a specialist. However, operating theatre and I.C.U. are contigous.

No preanesthesic medication or sedative was administered to the patients. A meticulous and thorough washing of the abdominal skin with antiseptic soap was carried out.

Local anesthetic was infiltrated into all layers (skin, subcutaneous tissue, aponeurosis, muscle and peritoneum) successively during the operation, The local anesthetic based on published studies [3,13] was 0.5% bicarbonated lidocaine with or without epinephrine. The usual anesthetic dose required was 60–80 ml (for a groin hernia). Haemostasis was required by ligaticin of the vessels with thin absorbable material, and/or electrical coagulation. Peritoneal approximation was carried out with slowly absorbable suture and aponeurotico–fascial continuous approximation with a continous 00 polypropilene suture. The skin was closed with a subcuticular suture of the same material and hypoallergenic porous.

Patients walked out of the operating room unassisted and immediately returned to their usual activities conditioned only by any discomfort they might have that was controlled by analgesics.

3. Results

Only seven of the 2100 cases (0.3%) had complications: three wound infections, with good response to local cures with sugar, a seroma that was drained without complications; a hematoma subsequent to trauma suffered by the patient and successfully treated by drainage; two atrophic testicles (once in a recurrence of a previous recurrence and the other subsequent to an infection).

Almost 3% of the operated patients developed minimal subcutaneous inflammatory responses that did not interfere with their postoperative course.

During the postoperative period, simple analgesic agents were administered as needed. The wound was inspected at 48 and 96 h. Patients who underwent ambulatory surgery were followed up postoperatively at 7, 15, 30, 90, 180, 360 days and subsequently every year.

Until now, not one of the 2100 operated patients have returned to the hospital because of medical complications (heart-attack, thromboembolism, etc) yet we have operated on many high risk cardio-respiratory patients).

4. Discussion

Inguinal hernias are the commonest abdominal wall pathology and have considerable economic implications. As such their repair gave a worldwide stimulus to one day hospital surgery, or early discharge surgery [10,12,14] In Aureggi's centre [1] where the patient is discharged from hospital two hours after their operation, to our knowledge in all other specialized centres, the patients are sent home the evening of the following day.

We would emphasize the difference between:

(1) Ambulatory surgery: with minimal preoperative and postoperative stay (our approach).

(2) Brief hospital stay surgery: a short recovery room stay, and subsequent postoperative controls in the following 2, 4, 6, 12 or 24 h.

(3) Surgery with a hospital stay of more than 1 day.

In all our cases the recurrence rate ranges from 0 to 1%. The complication frequency was similar or lower than that observed with traditional postoperative rest times. The specialization of surgeons, the use of inert sutures, the antiseptic precautions and the scientific principles adopted from experimental work in inflammation angiogenesis and cellular growth [6], as well as our clinical experience with this management, will allow the spread of the surgical range to almost all abdominal wall pathology. The following should be considered when selecting patients for ambulatory surgery:

(1) Physical, cardiac and respiratory condition; the more serious the case is, the more important it is to use our technique.

(2) Patient's level of understanding, attitude and acceptance.

(3) Size of the lesion.

(4) Reducibility of hernia.

(5) Interrelated factors.

In this important area of surgery there is active participation by surgical residents who are beginning their surgical experience. The fact of using local anesthesia without premedication compels them to be extremely delicate, gentle and careful with their manoeuvres. This contributes to an improved postoperative course.

The advantages of our approach to surgical management of abdominal wall pathology are:

(1) The excellent biological response of patients.

(2) The immediate return to their usual activities and work, that leads to a decrease in overall social costs.

5. Conclusions

We conclude that there are many advantages in ambulatory surgery undertaken as we describe:

(1) For the patient:

- Immediate ambulation.
- Immediate food tolerance.
- Immediate return to activities.

(2) For the health care system:

- Minimizes the needs of supporting infrastructure (drugs, beds, nursing, etc).

(3) For teaching purposes.

- It does not allow brusque manoeuvres.
- It compels acting with ductility and delicacy.

We also conclude that a new technique should be:

(1) For the surgeon:

- Simpler, less complex or easier to perform.
- More economical or less costly.

(2) For the patient:

- Gives better results.
- Have lower morbidity.
- Based on biological facts.

6. Commentary

The spirit of this work is to show two facts:

(1) There are various techniques for Hernia repair. With all of them, as long as the defect is reconstructed with solid anatomic or prosthetic elements, success can be obtained. The surgeon must choose, the most appropriate response for each case.

(2) There is no point, indeed it is counterproductive, to have a patient lying down to heal a wound. Doubtless biologically, as happens in the animal world, it is better to be active immediately.

To achieve this, the only thing needed is to modify the surgeon's behaviour, without the use of expensive, new technical tools.

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Day case tonsillectomy in children

J.J. Church

Day Surgery Unit, Salisbury District Hospital, Salisbury SP2 8BJ, UK

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Abstract

A pilot study was undertaken to assess tonsillectomy as a day case procedure. The post-operative morbidity following this study was entirely anaesthetic related. A protocol was written to standardise the anaesthetic, paying particular attention to pain, nausea and vomiting. The pilot study admission rate of 65% fell to $< 3\%$ immediately the new protocol was introduced. To date, 268 tonsillectomy procedures following this protocol have been undertaken as day cases with eight patients admitted directly from the day surgery unit and only one from home. All cases admitted were treated conservatively. This report summarises the policy, practice and outcome of day case tonsillectomy in children carried out since January 1994. The study has been undertaken jointly by the ENT Department and the Day Surgery Unit at Salisbury District Hospital.

Keywords: Day surgery; Tonsillectomy; Children; Anaesthesia

1. Background

With the reduction of hospital in-patient beds and the expansion of day surgery as an alternative to the in-patient management of surgical patients, the ENT Department at Salisbury District Hospital suggested that a pilot study be undertaken to look at the feasibility of performing tonsillectomy in children as a day procedure. As recently as 1985 the mean length of stay, in the UK, for tonsillectomy patients was 3.1 days [1]. It is now most unusual for patients to stay in hospital for more than 2 nights unless complications arise. There has been reluctance to continue this trend and to introduce tonsillectomy as a day procedure. Both surgeons and anaesthetists have expressed concern at the incidence of post-operative morbidity and the severity of complications should they occur. However, tonsillectomy as a day procedure has been common practice in North America for some years. It was therefore agreed that an objective view of the advantages and disadvantages should be undertaken.

2. Pilot study

Twenty children between the ages of 5 and 16, who lived within 30 min of Salisbury by private car, were admitted to a pilot study. Patients were excluded if there was no telephone at home, if there was not a dedicated adult, in addition to the driver, available to accompany the child home and to care for the child on the first post-operative night. The patients were placed early on the operating list and were observed for 6 h before being discharged by the ENT staff. The parents were telephoned by the clinical staff that evening and again the following morning. They were also given a contact at the hospital to ring should they be concerned during the night.

No strict anaesthetic technique was followed for the pilot group although all the patients were intubated and the majority given morphine during the peri-operative period. Surgery was performed by experienced surgeons using blunt surgical dissection with the use of bipolar diathermy for haemostasis. Of the 20 patients, 13 (65%) were admitted with severe nausea and vomiting. None

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were admitted for pain or bleeding. This admission rate was unacceptably high and arose from anaesthetic rather than surgical complications. The incidence of nausea and vomiting was similar to that reported by Stene et al. of 69% [2]. It was agreed, therefore, to establish a standard anaesthetic protocol which would address the post-operative morbidity. As the single complication from the pilot study was nausea and vomiting, all patients were given ondansetron intravenously after induction of anaesthesia as suggested by Litman [3] although in a smaller dose of 0.1 mg/kg.

3. Anaesthetic protocol

Pre-admission:	A non-milky drink before 07·00
Premed:	Nil other than EMLA cream when requested.
Induction:	Either intravenous with propofol or inhalation with Sevoflurane.
Airway management:	Laryngeal mask routinely unless inappropriate (small mouth) or anaesthetist's choice. Intubation, if chosen, with or without suxamethonium, taking care not to inflate the stomach when administering pre-intubation oxygen.
After induction:	IM morphine 0.1 mg/kg IV ondansetron 0.1 mg/kg slowly
Maintenance:	Spontaneous ventilation with oxygen, nitrous oxide and either enflurane or isoflurane.
After surgery:	Diclofenac suppository 1 mg/kg to nearest 12.5 mg.
Analgesia on discharge:	Paracetamol syrup—four times daily for 7 days. Brufen syrup–four times daily for 7 days. Parents are instructed to give analgesia regularly even if the child is not in obvious pain.

4. Main study

A further 50 patients were studied using the same exclusion criteria but following the standardised anaesthetic procedures above. Of the 50 patients, 32 also had their adenoids removed. No patient was admitted following tonsillectomy. Only one patient, from the whole series, was admitted following a slight bleed from the adenoid site. She required no further surgical intervention. No patient was re-admitted to hospital following their discharge home from the Day Surgery Unit. The incidence of post-operative nausea and vomiting had ceased to be an issue and it was decided to continue to treat children requiring tonsillectomy as day cases, provided they met the criteria for admission.

5. Recent experience

Day case tonsillectomy is now accepted practice in Salisbury for selected patients and 268 day case tonsillectomies have been performed following the above protocol. Of the eight patients admitted to the in-patient ward from the day surgery unit, all had adenoids removed as well as their tonsils. Four patients were admitted for surgical complications, one returned to the day surgery theatre directly from the recovery room for bleeding, the other three were managed conservatively and required no further surgical intervention. One patient was admitted because tonsillectomy was not anticipated but was found to be necessary in addition to the planned adenoidectomy. Two patients were admitted for nausea and vomiting and one was admitted because she refused to eat or drink before discharge. Only one patient was admitted from home after being discharged from the Unit. She had vomited blood during the night and her mother was advised to bring the child in to be assessed. On examination there was an organised thrombus on the adenoid bed and no further treatment was required. The incidence of re-admission has been lower than that of patients having tonsillectomy as an in-patient procedure. This latter group includes all patients over 16 years of age, when one would expect the incidence of surgical complications to be higher than in children. This is the subject of a new study.

Patients are not discharged until they can drink freely and have had something to eat. The importance of eating is stressed as it discourages the slough on the tonsillar bed to accumulate which is a common cause of secondary haemorrhage.

Post-operative analgesia was initially a problem with 50% of the first group of patients, returning pain scores of between 7 and 10 on a scale of 1–10 on a postal survey carried out after 48 h. After the introduction of the strict paracetamol/brufen regime, the mean score dropped to 3 with the highest score being 5. In most cases the pain was assessed by the parent.

Parental confidence is fundamental to the success of paediatric day surgery for any surgical procedure and tonsillectomy is no exception. No parent is put under pressure to consent to this method of treatment. Once the details had been fully explained only the parents of two children requested that the operation be done as an in-patient procedure. A questionnaire sent to the parents of 50 consecutive patients which asked the question "would you be happy for any other children in your family to have their tonsil removed as a day case?" revealed that only two of the 50 would not wish this to be the case.

6. Discussion

Reluctance to move appropriate surgical procedures from the in-patient to the day surgery environment is based on the belief that day surgery does not meet the same gold standards as in-patient surgery. Until day surgery units can demonstrate that both the physical environment and the clinical skills on offer are superior to the in-patient alternative then it is only right that quality should be the deciding factor. Whilst tonsillectomy is not a procedure regularly undertaken in day surgery units, the operation of adenoidectomy frequently is despite it being, in some cases, a technically more difficult operation, as it is performed blind and haemostasis is often more difficult to achieve. In this study, 50% of the surgical complications were associated with the removal of adenoids. Prejudice and historical practice are not arguments for failing to explore the full potential of day surgery.

Successful day surgery units are obsessional about the quality of peri-operative care, paying particular attention to the pre- and post-operative management of the patient. Careful assessment and patient confidence are fundamental to this success. The latter is achieved by ensuring the patient is fully informed on every aspect of the care plan, which is reinforced by detailed instructions on the post-operative period including effective analgesia.

Tonsillectomy in children as a day case procedure demonstrates how prejudice can be addressed safely and successfully. This initiative came from surgeons who were prepared to look objectively at ways of maintaining activity. They reviewed practice elsewhere and suggested the initial pilot study. They have been consistent in their support and the quality of their surgical input, ensuring that only fully trained surgeons are responsible for the operations. The Day Surgery Unit has developed a protocol which not only minimises post-operative morbidity but ensures the full confidence and co-operation of the parents.

This report demonstrates that with attention to detail, enthusiasm and the co-operation of patients, surgical procedures, often dismissed as inappropriate within a day surgical environment, can safely be undertaken as day cases.

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Interscalene block in day case open shoulder surgery—a preliminary report

C.E.R. Gibbons *, S.J. Pope, G. Samsoon, M.J. Curtis

Departments of Orthopaedics and Anaesthesia, Kingston Hospital, Galsworthy Road, Kingston upon Thames, Surrey KT2 7QB, UK

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Abstract

A prospective study of 43 patients undergoing day case open shoulder surgery under general anaesthesia was performed. All patients received an interscalene block for post-operative analgesia. Pre and post-operative pain scores, time to first dose of analgesia and patient satisfaction were recorded. Interscalene blockade provided good pain relief for up to 12 h in the majority of patients. Two patients were admitted due to inadequate pain relief and one complication of interscalene block was recorded.

Keywords: Analgesia; Patient; Pain relief

1. Introduction

Major open shoulder surgery can be very painful and may require hospital stay for pain relief. Recent reports have demonstrated the efficacy of interscalene blockade [1] for post-operative pain relief after shoulder surgery. The use of interscalene blockade for day case decompressive acromioplasty has previously been described with good results [2].

Interscalene block should result in the blockade of the upper roots of the brachial plexus as local anaesthetic is injected into the plexus sheath at the level of the sixth cervical vertebra. Interscalene injection may result in phrenic and recurrent laryngeal blockade [3] and vertebral artery injection has been reported.

In this study, the analgesic effects and patient satisfaction were recorded in 43 patients undergoing open shoulder surgery with general anaesthesia and interscalene blockade. All patients were under the care of the senior author and all interscalene blocks were administered by the same consultant anaesthetist.

2. Method

In this study, 43 patients underwent open shoulder surgery as day patients at Kingston Day Case Unit, over a 12-month period. Open subacromial decompression for impingement was performed in 27 patients. Other procedures performed included Bosworth scew fixation for disruption of the acromioclavicular joint, excision of the distal end of the clavicle with soft tissue stabilization and anterior stabilization of the shoulder.

All patients had a general anaesthetic and after induction, an interscalene block was performed with 40 ml of 0.25% bupivicaine. All blocks were performed by the same consultant anaesthetist with the aid of a nerve stimulator using the technique described by Winnie et al [4].

Pre-operative pain scores were recorded using the visual analogue scale method (0–100 mm) and pain scores were recorded at 1, 3, 12 and 24 h post-operatively by the patient. Patients were prescribed the same oral analgesia (Co-dydramol) during the post-operative period in the day unit and after discharge.

Each patient was telephoned the next day to record pain scores, time to first dose of oral analgesia, patient

* Corresponding author.

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Age	mean 49	(range19-68)
Sex	male 24	female 19
Operation		
Subacromial decompression	27	
Bosworth screw fixation	6	
Excision distal end clavicle	5	
Anterior stabilization	5	

Fig. 1. Patient data.

satisfaction and any complications of surgery or blockade.

3. Results

3.1. Patient data

The mean age of the patients in this study was 49 years (range 19–68), with the majority of patients being male (24).The type and number of operations are shown in Fig. 1.

3.2. Pain scores

The mean pre-operative pain score was 20 (VAS 0–100 mm) and pain scores at 1 and 3 h were recorded as 10 and 9, respectively (Fig. 2). Pain scores at 12 h were slightly higher than pre-operative levels, but at 24 h were significantly higher.

3.3. Time to first dose of oral analgesia

The mean time to first dose of analgesia was 8 h, which corresponded with the increase in pain scores using the visual analogue scale.

3.4. Complications

One patient sustained a haematoma at the site of the interscalene block, but did not require hospital admission. Two other patients had significant bruising at the surgical site, resulting in one superficial wound infection which was treated with oral antibiotics.

3.5. Patients requiring admission

Two patients were admitted for overnight stay from the day case ward, both due to failure of the interscalene blockade and inadequate pain relief. One patient was admitted via casualty later in the evening, with a perfectly working interscalene block which was not recognised by the admitting doctor.

3.6. Patient satisfaction

Out of 43 patients, 36 (84%) were satisfied with their pain relief. Forty-one recorded a variable pattern of numbness and weakness of the arm, which was consistent with a successful interscalene block.

4. Discussion

Shoulder surgery may result in significant pain postoperatively and in many centres shoulder procedures are not performed as day cases.

In our series, 43 patients undergoing open shoulder surgery were chosen as day case patients. All patients received an interscalene block after induction and the side effects were fully discussed on the day of opera-

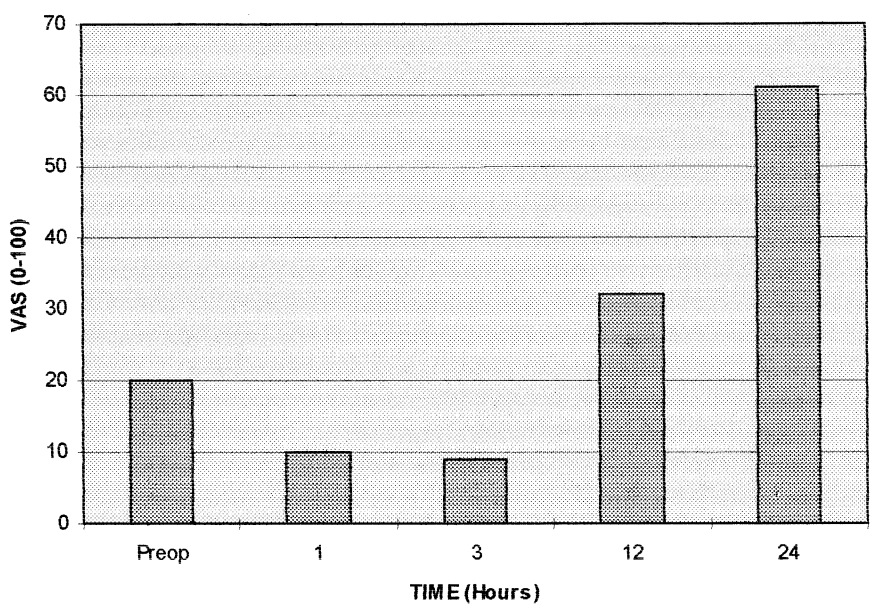

Fig. 2. Pain scores (visual analogue scale).

tion. Two patients (5%) were admitted due to inadequate pain relief and therefore the success of interscalene block in our series was high.

Three patients recorded post-operative complications, one due to haematoma formation at the site of the interscalene block. There were no respiratory complications. Urmey et al. have reported a 100% incidence of hemidiagphragmatic paresis (phrenic nerve blockade) diagnosed by ultrasonography after interscalene blockade anaesthesia [5].

Visual analogue scales and time to first dose of analgesia showed that the interscalene block worked well in the majority of patients for 12 h and then tailed off. This has been shown to be the case in other series using interscalene blockade [6].

5. Conclusion

Open shoulder operations can be painful procedures requiring good post-operative analgesia. In carefully selected patients, our series shows that a number of open shoulder procedures can be successfully performed as day cases with the aid of interscalene blockade.

In our series, 84% of patients were satisfied with their post-operative pain relief. There were two failures of interscalene blockade requiring hospital admission and one complication of haematoma formation due to the block.

The side effects of interscalene block should be discussed before the operation and also the patients should be aware that the analgesic effects of the block diminishes after 12 h.

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Outpatient tonsillectomy: a prospective 7 years study—complications and comparison with inpatients

M.P. Rivas Lacarte *

Department of Otorhinolaryngology, Hospital de Viladecans, Avgda Gavà 38, 08840 Viladecans, Barcelona, Spain

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Abstract

Tonsillectomy is the most common major surgical procedure performed on children in some countries. In a prospective study over 7 years we compared the incidence of complications in 313 inpatient and 113 outpatient tonsillectomy cases, in children from 3 to 15 years. The mean surgery time in outpatients was 23 min and discharge was 115–223 min after surgery. Complications occurred in 1.65% of inpatients and 1.76% of outpatients (two unexpected admissions for haemorrhage and anaesthetic complication). All complications were less in outpatients. We conclude that tonsillectomy is a safe procedure in children ASA I–II more than 3 years old. Complications are few and not dependent on age. Discharge is possible 4 h after surgery.

Keywords: Tonsillectomy; Day-case surgery; Outpatient surgery; Complications; Safety; ENT

1. Introduction

Tonsillectomy is the most common major surgical procedure performed on children in some countries. In the USA it accounts for a least 390000 operations a year in the UK no more than 85000 a year [1,2]. Traditionally it has been performed as an impatient procedure with discharge on the first postoperative day.

Complications after tonsillectomy are infrequent. Them most serious complications being haemorrhage (0.10–8%) [3–7] and acute compromise of the airway (0–20%)[6–10]. Other postoperative problems are poor oral fluid intake with or without dehydration, pain, vomiting and fever. The total incidence varies from 0.30–10% [2,6–9,11,12,15]. Possibly, complications increase if patients are less than 36 months of age [13–15].

At present, because of health-care cost savings tonsillectomy is undertaken as outpatient surgery in some centres [8–11,13,14,16–25] and discussions and safety are increasing. Prospective studies about safety in outpatients are few.

We present a prospective 7 years study made at the Viladecans Hospital, to examine the safety of outpatient tonsillectomy, recording the complications in the 2 weeks after surgery. Results are compared to inpatient surgery and the current literature.

2. Patients and method

The study included all patients 3–15 years old, that underwent tonsillectomy with or without adenoidectomy, under general anaesthesia from January 1, 1991 to January 1, 1998.

Patients had inpatient or outpatient tonsillectomy depending on patient and parents preference, and specific conditions for ambulatory surgery such as, phone for postoperative control, adequate family environment, no psychiatric disease or difficulty in understanding orders, and no severe accompanying pathology (ASA III–IV) [22,26].

* Tel.: +34 936 590111; fax: +34 936 590612; e-mail: h551uprl@hv.scs.es

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The ambulatory surgery unit is located on the third floor of our hospital, in an independent area. There are two operating rooms eight first stage recovery beds and eight second stage recovery beds.

The sequence of events for outpatients are: (a) ENT surgeon consultation. History data, physical examination and enrolment for surgery (inpatients or outpatient). Parents and patient (only teenagers) write consent. Preoperative study according to the ASA (American Society of Anesthesiology), (b) Anaesthesiologic visit (day surgery area). History, physical examination and preoperative tests evaluation. (c) Nursing staff interview (immediately after anesthesiologist visit), information and explanations about day-surgery area and surgery. A nurse telephones the patient's home 1–5 days before surgery. If the child had any problem further checks are undertaken. (d) Admission to the day-surgery area.

Surgical technique was tonsillectomy by dissection and snare. Hemostasis was obtained with suture ligature of the tonsillar fossa. Adenoidectomy was performed using a currette or adenotome, and hemostasis was obtained using intraoperative nasopharyngeal packing.

All anesthesia was general. Intranasal administration of midazolam (0.2 mg/kg) was used to obtain sedation in pre-school children. Anaesthesia was induced by propofol (3 mg/kg) and succinylcholine (1 mg/kg) and maintained by propofol or halothane. In the last year the anaesthetic agent sevofluorane was also used. Tracheal intubation was used. After surgery and before the patients left the operating room, gastric contents were evacuated with a nasogastric tube. Postoperative pain was treated with paracetamol. No patient received meperidine.

In the first stage recovery room, patients were monitored by the nursing staff, and oral fluid intake started gradually 30–60 min after surgery. Parents accompanied their children in the second recovery room. Discharge was undertaken 3–6 h after surgery when the patients were, stable and free of complications (no surgical complications, and meeting modified postanesthesia discharge scoring system (PADASS) and nursing criteria). Poor oral fluid was not a criteria for delayed discharge.

All incidents were recorded by nursing staff in the two recovery areas.

Written instructions concerning home care were given, and patients had a personalised postoperative control. In all cases a nurse telephoned the patient's home on the first postoperative day and surgeons visited the patient 2 weeks after. Other contents or visits in the postoperative were according to medical orders. Parents had a special telephone number to call to request further advice, and the emergency area of our hospital dealt with and reported complications and re-admission. Immediate and additional surgical procedures during the first post operative weeks (e.g. for delayed bleeding), anaesthetic complications (e.g. delay in waking up), compromised airway, high temperature (more than 38°C), pain that needed additional treatment, poor oral fluid intake and vomiting, were considered complications or incidents and recorded.

Differences in the sequence of events for inpatients were: (a) visits were not in the day-care area, (b) did not have personalised nursing staff or telephone checks and (c) discharge occurred on the first postoperative day. Other procedures and controls were similar.

3. Results

From January 1, 1991 to January 1, 1998 tonsillectomy was performed in 445 patients, (332 inpatients and 113 outpatients). Tonsillectomy comprised 10% of total outpatient ENT surgery and the 4% of total ENT surgery.

Excluding ASA III–IV patients (only outpatients) we had two groups of 313 and 113 patients respectively. The mean age of inpatients was 6 years (65.66% from 3 to 7 years), with 181 males (56.6%) and 132 females (43.4%). The mean age of outpatients was 5.67 years (72.1% from 3 to 7 years), with 67 males (59%) and 46 females (41%). They were two homogeneous groups.

Time of surgery varied from 13 to 48 min (including adenoidectomy), with a mean of 23 min. Discharge was from 115 to 223 min after surgery, (mean 173 min).

Inpatient complications amounted to 1.65%: two reinterventions for immediate bleeding, one delayed bleeding 8 days after surgery, and two delayed discharge for 24 h for observation (discrete haemorrhage and fever more than 38°C). No haemorrhage produced hypovolemia or needed blood transfusion. No discharge was delayed for dehydration, but four patients (1.27%) had delayed oral intake fluid because of dysphagia (1) or vomiting (3). No admissions occurred for pain, but it was said to be an important problem by 30% of patients. Fever less than 38°C was present in 24 cases.

Outpatient major complications were two (1.76%): one haemorrhage that needed surgical revision and one anaesthetic complication (delayed in waking up) Surgery times were 45 and 10 min respectively. Discharge was delayed 24 h in the two cases. No readmission occurred in the 2 weeks after surgery. In this time, eight outpatients needed more analgesia for severe pain, one child presented vomiting and two children had fever less than 38°C.

In the total series the incidence of haemorrhage was 1.24% (1.65% for inpatients and 0.88% for outpatients). Primary bleeding occurred in 0.95% and delayed bleeding in 0.31%. Additional surgery was necessary in

Table 1
Complications, age of patients and surgery's time (S = minutes)

Cause	Inpatients ($n = 313$)	Outpatients ($n = 113$)	
Immediate bleeding	3 years ($S = 7$) 15 years ($S = 22$)	10 years ($S = 43$)	
Delayed bleeding	9 years ($S = 12$)	—	
Delayed discharge (24 h admission in outpatient)	7 years–fever ($S = 20$)	4 years–anaesthetic complication ($S = 20$)	
	15 years–observation discreet bleeding ($S = 28$)	10 years–immediate bleeding	
Delayed oral fluid intake	12 years (dysphagia) ($S = 17$)	—	
Vomiting	4 years ($S = 15$)		
	5 years ($S = 28$)	4 years ($S = 10$)	
	5 years ($S = 12$)		
Analgesia (more than standard)	30%		4 years ($S = 15$)
			4 years ($S = 12$)
			5 years ($S = 28$)
		8 cases (7%)	6 years ($S = 15$)
			6 years ($S = 10$)
			8 years ($S = 28$)
			14 years ($S = 22$)
			14 years ($S = 15$)
Fever (less than 38°C)	24 cases (7.66%)	5 years ($S = 7$) 6 years ($S = 12$)	

0.95%. Pain was said to be an important problem by 30% of patients, but only 6.88% needed more analgesia. Vomiting was present in 0.88% of the total patients, and fever was less than 38°C in the 6.10% of patients.

See complications, age of patients and surgery times in Table 1.

4. Discussion

The incidence of delayed discharge, unexpected admissions and complications in day-cases varies from 0.20% to 9.35% [27–29] in the current bibliography. Ogg [29] presented in 1997 a series of 425 cases (1.36%) that required direct hospital admission following surgery in 31195 day operations. Post-tonsillectomy complications made up and important percentage of total complications (4.62%–17.21% [12,19,29]). In our series they accounted for only 3.7% of the total day surgery complications.

Some points are controversial in the literature about outpatient tonsillectomy: time of discharge after surgery, age, oral fluid intake and SAS.

4.1. Time of discharge after surgery

Prospective studies in outpatient tonsillectomies are few [8,9,14,25,30]. The most important series are inpatients revisions that measures safety according the complications in the 4, 6, 10 or 24 h after surgery and in the hypothesis that discharge was done in this times (supposed outpatients). Carithers [5] (2613 inpatients in 1987) stated that the procedure was safe if discharge was 10 h after surgery, and in his series the possibility of readmission if discharge was 4 h post-operatively was 25%. Helmus [1] (788 same-day patients in 1990) and Yardley [2] reported that was safe 8 h after surgery. Guida [21] with discharge after 6 h had a 3.8% complication rate (804 inpatients in 1990). Only 20% of tonsillectomies in Contencin's [23] series (259 inpatients in 1995) were deemed to be safe for outpatient surgery, and for Drake–Lee [30] the figure was 50% (500 inpatients in 1997).

In our outpatients the mean discharge time was 173 min (the most delayed 223 min) after surgery. In the total series (313 inpatients and 113 outpatients) all immediate complications occurred before 3 h after surgery. In consequence, we think that discharge is safe 4 h postoperatively.

4.2. Age of patients

For some authors the 3 years in a security barrier of possible complications in tonsillectomy. The rate of unexpected admissions varies in outpatient and prospective studies from 0.37% [10] to 3.36% [12]. This is reported to increase to 9% [14] if patients are younger than 3 years. Causes were haemorrhage (primary or delayed), pain, vomiting and fever. Our admission rate was 1.76%. The concept of unexpected admission is not possible in inpatients that stay overnight.

Table 2
Incidence ratio complications

	Outpatient	Our serie (n = 113)	Inpatient	Our series (n = 113)
Primary bleeding	0.83% [8]−5.2% [25]]	0.88%	0.1% [31]−2.15% [3]	0.63%
Delayed bleeding	0.37% [10]−0.49% [25]	0	1.3% [21]−6.4%[11]	0.32%
Additional surgery	0.83% [8]	0.88%	0.08% [19]−13% [32]	0.63%
Vomiting	0.6% [15]−2.5% [12]	0.88%	1.7% [8]−62% [21]	0.95%
Pain	9.7%−17%	6.88%	—	30%
Fever (less than 38°C)	0.18% [10]−20% [25]	1.76%	0.24% [18]−1.4% [21]	7.66%
Anaesthetic complication	14% [12]−15.7% [35] of total complication	0.88%	—	—

Delayed discharge is reported to be from 1.8% [21] to 2.42% [11] in inpatients and from 0.37% to 0.49% [21] in outpatients (52.4% [13] in children younger than 3 years). Our rate was 1.27% in inpatients. On reviewing the literature, age appears not to be an important factor in other complications, expect for oral fluid intake and SAS problems.

4.3. Oral fluid intake

Poor oral intake varies from 1% [11] to 8.5% [5] in inpatients and from 3.7 to 10% in outpatients. Patel [31] affirms that fluid intake was higher in overnight patients because intravenous fluid administration was longer than in outpatients and this is the cause of a minor number of complications. This point is contradicted. For Rothschild [32] the mean time to oral intake was 26.5 h in children younger than 4 years and for Schreiner [33] children should not drink before discharge because intravenous fluid administration is enough.

In our day-case area, oral fluid intake is not considered a discharge criteria in children and was not the cause of delayed discharge in any outpatient is this study. Oral intake is only a proof of adequate deglutation.

4.4. SAS

Recurrent infection was the first indication for tonsillectomy 20 years ago. Actually more than 19% of indications are airway obstruction [34] that in some cases cause nocturnal apnoeas. Reiner [20] compared two groups of children with obstructive apnoea undergoing inpatient and outpatient tonsillectomy. Overall complication rates were 6.5% and 3.6% respectively (children younger than 4 years). In our experience the risk of complications following surgery is not increased and we don't undertake polisomnography and sleep studies if patients are not obese. None of our patients presented airway complications.

The incidence of other complications is similar in our series to that in the literature (see Table 2). Complications fates are if higher follow-up is prolonged to 1–2 weeks [26], and varies depending on factors such as the experience of the surgeon size of the series and the accuracy of selection. One study suggests that the complication rate is higher in docent [35] and the integrate hospital units that in Freestanding [36].

5. Conclusion

1. Tonsillectomy is safe. Outpatients complications are few.
2. Discharge is possible 4 h after surgery.
3. Age has no influence on the complications rate (children older than 4 years)
4. Oral intake is not a necessary discharge criteria in children
5. Nocturnal apnoea due to obstruction is an indication for tonsillectomy and does not increase the risk of complications.

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Ambulatory Surgery

Patients' experiences of day surgery—an approach to quality control

T. Kangas-Saarela *, J. Ohukainen, M. Koivuranta

Department Of Anaesthesiology, Oulu University Hospital, Kajaanintie 52, 90220 Oulu, Finland

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Abstract

Patients' experiences are recognised as the focus of quality assurance in day surgery. One method of following up patients' outcomes and satisfaction is by telephone interview. A prospective survey was made of 217 randomly selected day surgery patients. A total of ten patients of the original study group were admitted to hospital and four were not reached by phone. The survey was completed with 203 patients. Of these, 11.3% (23.3% after general and 6.8% after spinal anaesthesia) had experienced nausea either at hospital, on their way home or at home. After discharge, 10.3% of the patients had experienced no pain but 4.5% rated their average pain very severe. At the time of the interview 31% had no pain, but three patients still rated their pain as very severe. A total of 2.3% of the spinal anaesthesia patients needed a blood patch and 10.6% spontaneously reported having experienced pain in the lower limbs or back. During the first 24 h after discharge, most of the patients felt well with only slight discomfort after the different anaesthetic techniques. A total of 90% were very pleased and 10% fairly pleased with their day surgery experience. None of the patients were dissatisfied.

Keywords: Say surgery; Ambulatory anaesthesia; Nausea; Pain; Patient satisfaction; Quality control

1. Introduction

Day surgery has gained wide popularity during the last few years. The patients are followed carefully during their stay in hospital, and pain and nausea are treated promptly according to the hospital routines. Normally, these patients are referred to health centres or to their own doctors for postoperative visits and do not come back to the operating hospital if there are no major complications related to the surgery or anaesthesia. Hence, the operating unit usually does not know how the patients manage after they leave the hospital. Yet patients' experiences are recognised as one of the main focuses of quality assurance in day surgery. The day surgery unit should monitor constantly patients' welfare, satisfaction or dissatisfaction and record all the complications in order to improve future management and outcomes. One method of following up patients' outcomes and satisfaction is by telephone interview. In units with a small number of daily operations, every patient can be contacted by phone the next day, but in a big unit routine interviews are seldom possible due to limited staff resources. Hence, we decided to make a survey to assess the quality of care and the patients' overall satisfaction with their day surgery in our unit.

2. Patients and methods

After approval by the Ethics Committee of the Medical Faculty, University of Oulu, the study was carried out as a prospective survey of the incidence of postoperative nausea, vomiting, pain, complications and patients' satisfaction with their day surgery experience. A total of 217 patients scheduled for day surgery were randomly selected as a study population. After consent by the patients, a detailed chart of the pre-operative history and the events in the operating theatre and recovery room was filled in by anaesthesia nurses. A

* Corresponding author. Tel.: +358 8 3152011; fax: +358 8 3155577.

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telephone interview was made by the anaesthesiologist on the following day. In the preoperative interview the patients were asked about their smoking habits, history of motion sickness and migraine and previous postoperative nausea after both general and regional anaesthesia.

Patients were not premedicated and no prophylactic antiemetic medication was given. During a 2-h period after the operation, the occurrence and intensity of nausea, vomiting and pain medication were recorded. Nausea was evaluated by the patient's subjective sensation of feeling sick or wanting to vomit. Emetic episodes were recorded separately as retching or vomiting. The average postoperative sedation during the assessment period was evaluated by the recovery room nurses using a five point rating scale (1, fully awake, 2, sleepy, 3, mostly awake, 4 sleeping but waking up and 5 as unconscious).

On the following day, the patients were asked to ascertain their nausea after leaving the unit by using an 11-point rating scale (0, no nausea; 10, worst possible nausea) and report the number of emetic episodes. The patients were asked to define whether the nausea was associated with travelling home, movement in general, oral intake of liquid or food, pain medication, or if it occurred without any precipitating factor.

The intensity of pain was evaluated as an average during the 24-h period and also at the time of the interview on an 11-point rating scale (0, no pain, 10 worst pain imaginable). The use of pain medication was recorded.

The patients were also asked whether they had a headache or any other untoward symptom after discharge. The overall satisfaction with the day surgery experience (operation, anaesthesia and aftercare) was expressed as dissatisfied, fairly pleased or very pleased.

3. Results

A total of ten patients (4.6%) of the original study group were admitted to hospital: five due to more extensive surgery than planned, four due to excessive pain and one due to cardiac arrhythmia. Four patients were not reached by phone. Thus, the survey was completed with 203 patients (Table 1), of whom 65% had orthopaedic lower limb surgery, 11% hand surgery and 24% general surgery. The anaesthetic technique was spinal in 65%, general in 21%, intravenous regional in 10%, and brachial plexus, epidural or local infiltration in 4%. The course of anaesthesia was uneventful in all cases.

Table 1
Patient characteristics

Males/females (%)	46.3/53.7
Age (years), medium (range)	41 (16–57)
ASA physical status (%)	
1	85.7
2	12.3
3	2.0

Table 2
The incidence of nausea predicting factors among patients having or not having nausea and emesis (%)

	Nausea/emesis ($n = 23$)	No nausea ($n = 180$)
Current daily smoking	26	32
Migraine	43	21
History of motion sickness	52	34
PONV after previous general anaesthesia	26	28
PONV after previous regional anaesthesia	13	6

During the 2 h in the recovery room, 99% of the patients were alert and awake, scoring 1 while only one patient scored 2 and one scored 3. During this period, nausea was experienced by 6.4% of all patients and one patient vomited once. A total of three patients were treated with antiemetics. After discharge, 12 patients (6%) experienced nausea, associated variably with movement, oral intake of food or fluids or pain medication. None of the patients had severe nausea (four patients scored their nausea as five, and eight patients as one to four). One patient took antiemetic medication at home. Of all the patients, 11.3% (23.3% after general and 6.8% after spinal anaesthesia) had experienced nausea either at hospital, on their way to home or at home. The percentage of patients who were regular smokers, who had a history of migraine or motion sickness or who had had nausea or vomiting after previous general or regional anaesthesia among the patients having no nausea or vomiting and those having nausea and/or vomiting are shown in Table 2.

Most of the patients (60.6%) received non-steroidal anti-inflammatory drugs (NSAIDS) as their sole pain medication in the recovery room, while 29.6% got a combination of codeine and paracetamol and 4.4% parenteral opioids and 5.4% had no pain medication.

The overall pain score after discharge was 4.1 ± 2.6. The distribution of overall pain is shown in Fig. 1. A total of 21 patients (10.3%) experienced no pain and ten patients (4.5%) rated their average pain as very severe (scores 9 or 10). At the time of the interview the mean reported pain score was 2.4 ± 2.3. The distribution of pain is shown in Fig. 2. The number of patients having no pain was 63 (31%), whereas three patients still rated their pain as very severe.

One third of the patients had taken no pain medication, two thirds had taken one to three tablets, and

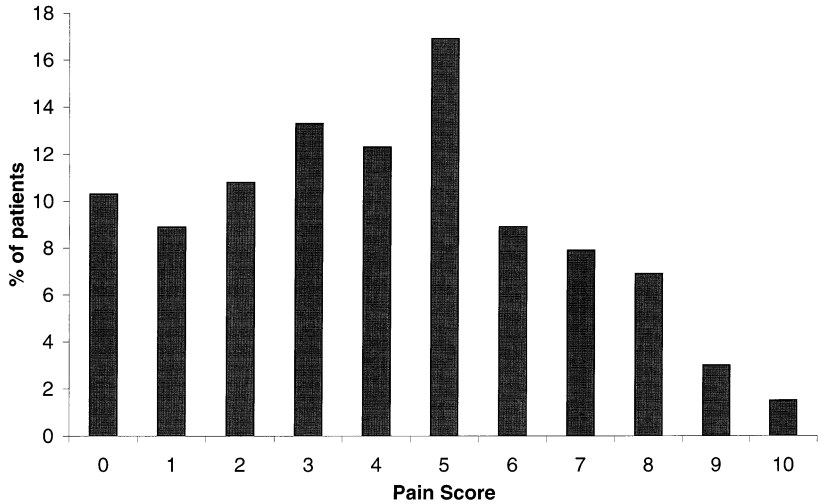

Fig. 1. The distribution of overall pain after discharge.

10.9% had needed more than three tablets of painkillers, mostly oral NSAIDs or paracetamol. Only 25 patients had taken oral opioids, mainly codeine combined with paracetamol.

Altogether 27 patients had experienced headache after discharge, 22 of them after spinal anaesthesia. Only three women aged 37–45 years (2.3% of the spinal anaesthesia patients) needed a blood patch. Lower limb or back pain was spontaneously reported by 14 (10.6%) spinal anaesthesia patients. Of these, eight had received mepivacaine, five lidocaine and one bupivacaine blockade. A total of six patients (three after GA, two after spinal anaesthesia and one after intravenous blockade) complained of having a sore throat. The percentage of patients having any discomfort (back and/or lower extremity pain, headache, nausea and/or vomiting or a sore throat)was 31.8% among the spinal patients and 30.2% among the general anaesthesia patients.

A total of 182 patients were very pleased and 21 fairly pleased with their day surgery experience. None of the patients were dissatisfied.

4. Discussion

In our survey, the number of unexpected hospital admissions was higher than in some earlier studies [1,2]. The fact that one third of our ambulatory patients come as direct referrals and see both their surgeon and the anaesthetist for the first time on the operating day may increase the number of cases needing hospital admission due to more extensive surgery than planned on the basis of the referral note. The long distances (up to 250 kilometres) our patients have to travel to hospital may also increase the need to stay at the hospital in the presence of even mild to moderate pain.

The total frequency and severity of nausea in this survey was lower than an earlier survey among inpatients at the same hospital [3]. This difference is probably due to the high number of orthopaedic cases operated on under regional anaesthesia producing a lower incidence of nausea [4] and the limited use of parenteral opioids for post operative pain relief. The number of hospital admissions due to nausea and the occurrence of nausea requiring medical intervention was also lower than in the study of Green et al. [5], where outpatients were randomised into different general anaesthesia groups. The reason for this difference is that some predisposing factors had obviously been taken into account when deciding on the method of anaesthesia in our survey, showing one aspect of good quality in anaesthesia care. This survey again revealed the known fact [6] that patients with a history of migraine and motion sickness have an increased tendency towards postoperative nausea or vomiting.

Even with the mean overall pain score being acceptable, excessive pain occasionally contributed to an unexpected hospital stay and some patients rated their pain as very severe even at home. This indicates that our pain relief needs improvement. As most of our case were arthroscopies, the use of intra-articular morphine [7] could be one solution.

The incidence of postspinal headache was relatively low, judged by the number of patients needing a blood patch, but a more detailed analysis of all headache cases would probably increase the total incidence and indicate the use of special spinal needles instead of our 27 gauge conventional needle.

Postoperative back pain is a common complication after spinal anaesthesia [8,9], but recent reports [10–12] suggest the pain in the lower back, hips and lower extremities to be a sign of transient neurological toxicity from intrathecal local anaesthetics. The high inci-

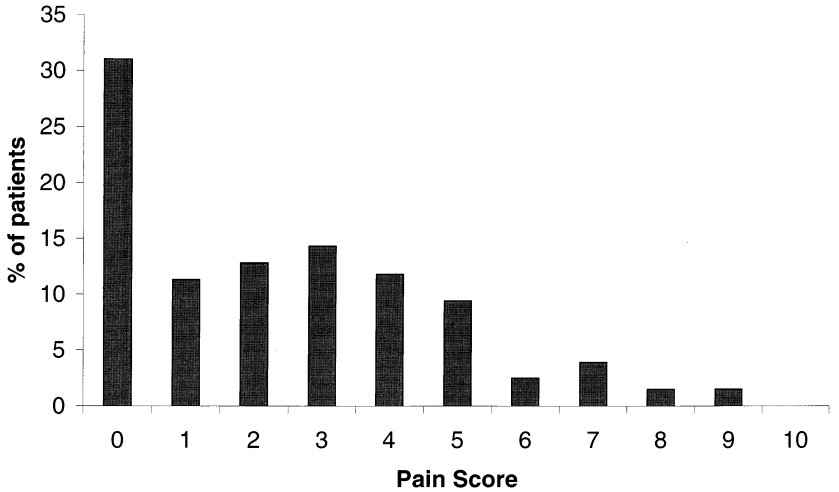

Fig. 2. The distribution of pain at the time of the interview.

dence of these pains in our survey might be due to the use of 5% heavy lidocaine in doses up to 100 mg.

5. Conclusions and clinical implications

Our high admission rate warrants further evaluation, especially of the cost effectiveness of direct referrals.

During the first 24 h after discharge, most of the patients were pleased and feeling well with only slight discomfort after the different anaesthetic techniques. The findings indicate that the occurrence of nausea and particularly vomiting was low among our ambulatory patients and did not cause any hospital admissions. Thus, routine antiemetic prophylaxis would not be cost-effective, but could well be considered in the presence of predisposing factors, such as a history of emesis and motion sickness, to improve the quality of recovery among these patients.

After discovering the high incidence of back and lower extremity pain, we reduced the dose of lidocaine (maximum 60 mg) and are exploring the possibility of replacing lidocaine with bupivacaine solution.

As the overall incidence of complications and patient satisfaction was independent of the type of anaesthesia, the anaesthetist may also choose the anaesthetic technique in view of considerations that may enhance rapid turn-over of patients in the unit. Still, a further evaluation of postoperative pain treatment is necessary. As no correlation was found between the type of operation and severe pain at home, the provision of analgesics and unambiguous instructions for their use at home are a crucial factor for all patients.

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Outpatient anterior cervical microdiskectomy: experience with 106 cases

Richard N.W. Wohns [a,*], Roger D. Robinett [b]

[a] *1802 S. Yakima, Suite 306, Tacoma, WA 98405, USA*
[b] *Good Samaritan Surgery Center, Puyallup WA, USA*

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Abstract

Cervical disk disease is a common problem. Most commonly, anterior cervical microdiskectomies are performed in a hospital operating room with a 1–3 day inpatient stay. These procedures can be performed on an outpatient basis with minimal morbidity and patients can be discharged in 2–4 h. 106 consecutive patients underwent outpatient cervical microdiskectomies either at a free-standing outpatient surgery center or on an outpatient basis in a hospital operating room. The average post-operative time in the recovery room prior to discharge home was under 3 h.

Keywords: Anterior cervical microdiskectomy; Outpatient anterior cervical; Microdiskectomy

1. Introduction

Cervical disk disease is a common problem seen on a daily basis by the majority of neurosurgeons. Herniations range from minor to large free fragments and are treated either conservatively or with surgery depending on the clinical situation. Those patients appropriate for an anterior cervical microdiskectomy generally have disk herniations causing medically refractory radicular pain and/or objective evidence of radiculopathy or myelopathy. These candidates must be free of psychological or medical contraindications. The 'ideal' patient has failed all forms of appropriate conservative therapy, has a single level unilateral disk herniation and no significant medical or psychological risk factors. The patients are all counseled pre-operatively in a standard fashion regarding the risks, benefits and alternatives to the procedure. Further detailed discussion is then carried out regarding the specifics of the outpatient protocol so that patients are fully informed of the expected peri-operative experience and have appropriate expectations post-operatively.

Most commonly, anterior cervical microdiskectomies are performed in a hospital operating room with the inpatient hospital course lasting 1–3 days. The average LOS in this author's personal series over the last 3 years is less than 24 h with the average hospital bill being substantially higher than the charges in an ambulatory surgery center (ASC). By selecting ideal patients for the outpatient surgical environment (Vise M, personal communication) [1–5], coupled with meticulous micro-neurosurgical technique and a specific anesthetic regimen for ambulatory surgery, 106 patients have been successfully operated in an ASC or on an outpatient basis in a hospital operating room. The average post-operative time in the recovery room prior to discharge home has been under 3 h. The average cost per patient is 32% lower than area hospitals, including anesthesia services. Patient satisfaction with the entire outpatient anterior cervical microdiskectomy experience has been extraordinarily high and the surgical outcomes thus far are equal to that which is considered standard for inpatient anterior cervical microdiskectomy.

* Corresponding author. Tel.: +1 253 6277338; fax: +1 253 6277339.

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2. Materials and methods

Between July 1995 and July 1997, the author performed 106 consecutive outpatient anterior cervical microdiskectomies, 58% males and 42% females, either at a free-standing outpatient surgery center or on an outpatient basis in a hospital operating room. All patients had failed conservative treatment (which included medications, physical therapy and for some patients epidural steroid injections) and symptom duration ranged from 3 weeks to 6 months.

The surgical procedures were all performed under general anesthesia. Induction was performed with propofol, intubation with D-tubocurare/succinylcholine and maintenance with Euflurane/nitrous oxide. No other anesthetic agents were employed.

All patients were given 2 g of cephazolin and 125 mg of methylprednisolone intravenously at the time of induction. Surgery was performed in the supine position, with the head on a Mayfield headrest, 0.25% marcaine with 1:100000 epinephrine was injected for local anesthesia in a skin crease on the right side of the neck over the affected disk level.

A 2 cm incision in the skin crease was made extending from the mid-line to the right. The platysma was undermined from the subcutaneous tissue, then opened vertically in the direction of its fibers. The plane between the trachea and esophagus medially and the carotid and stemocleidomastoid laterally was then developed using blunt dissection. The pre-vertebral fascia was swept off the anterior longitudinal ligament and the longus colli muscles stripped laterally 2–3 mm. Caspar self-retaining retractors were then placed in the longus colli and needles inserted at two disk spaces. An ear oximeter was used to measure oxygen saturation as a way of detecting possible compromise of blood flow through the right carotid artery during the longus colli retraction. An X-ray was taken to localize the correct level for the microdiskectomy. Following X-ray localization, Caspar distraction screws were placed and the distractor applied across the affected disk space. A radical anterior microdiskectomy was then performed with complete removal of the disk, any osteophytes present, cartilaginous endplates and the posterior longitudinal ligament. Adequate foraminal decompression was always ascertained with foraminotomies performed, if necessary.

Hemostasis was meticulously obtained with bipolar cautery and the wound was then irrigated profusely with bacitracin solution. Small amounts of gelfoam soaked in thrombin were used as necessary to control foraminal venous bleeding and to control bleeding from the holes where the Caspar distractors were placed in the vertebral bodies. Hydrogen peroxide was utilized in the disk space to control bone bleeding in several cases. Closure was accomplished in layers with an absorbable suture (Vicryl) and steri-strips. Sterile dressings were applied, followed by a soft cervical collar. The patients were then awakened from general anesthesia and brought to the recovery room. Prior to discharge from the recovery room, an additional 80 mg of intravenous methylprednisolone was given. The criteria for discharge were no nausea, ability to take oral fluids, adequate incisional pain control and ability to ambulate and urinate.

Discharge instructions, prescriptions for narcotic pain medication and non-steroidal anti-inflammatory drugs (NSAID's) and/or muscle relaxants (in some cases) were given to the patients. The soft collar was worn for 2 weeks continuously and thereafter only in a car or when the cervical region was sore. A return to work schedule was established with the patients. The earliest returns to work were 3 days post-operatively and the longest 3–4 weeks post-operatively. In this latter category were patients who had strenuous jobs, but were released to light duty work.

3. Results

There were no post-operative infections or hematomas. One patient required Zofran (ondansetron) for post-operative nausea and vomiting. None of the patients required post-operative hospitalization. There have been no recurrent disk herniations in this series. Three patients have required fusion for mechanical neck pain.

A post-operative satisfaction and outcome survey was conducted in conjunction with the first author's Executive MBA program (Ahlowalia G, Brown J, Grismore J, Ronbeck K, Wohns RNW: Survey of Patients Who Have Undergone Outpatient Microdiskectomy. University of Washington EMBA 503 Term Project, 1996). This revealed overall excellent patient satisfaction with clinical outcome and the outpatient experience. Outcome analysis, cost effectiveness and patient satisfaction are the three parameters of the quality of medical services that are of prime interest to physicians, HMO's, insurance companies and patients. The costs associated with outpatient spinal microsurgery are significantly less than for the inpatient approach. A survey was designed to evaluate patient satisfaction and clinical outcomes. Quantitative and qualitative data have been analyzed from the completed surveys. Quantitative parameters include standard demographics and objective measurements of surgical outcome. Qualitative data include such parameters as pain assessment and satisfaction with service and outcome. This survey strongly suggests that outpatient microdiskectomies for cervical disk herniations can be performed with excellent outcomes and quality and high patient satisfaction levels.

4. Conclusion

The purpose of this communication is the portrayal of a successful outpatient regimen for anterior cervical microdiskectomy. Since the follow-up time is limited (1–18 months), the long term results cannot be presented at this time. However, there have been no indications that the results are anything but analogous to the same procedure performed on an inpatient basis. There have been no infections nor any significant problems or complications. Patients have completed satisfaction surveys which have routinely depicted a high satisfaction level and excellent clinical outcomes.

This series suggests that outpatient anterior cervical microdiskectomies can be safely performed with the same positive results as experienced following an inpatient procedure. The advantages include a significant reduction in cost to the patient (and third party payers) and a high level of patient satisfaction. Further studies are needed to confirm these findings.

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Information needs of general day surgery patients

Colin Bradshaw [a,*], Chris Pritchett [b], Celia Bryce [a], Shirley Coleman [c], Helen Nattress [a]

[a] *Marsden Road Health Centre, South Shields, Tyne and Wear, NE34 ORE, UK*
[b] *Department of Surgery, South Tyneside District Hospital, South Shields, Tyne and Wear, UK*
[c] *Department of Mathematics, University of Newcastle upon Tyne, Newcastle upon Tyne, UK*

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Abstract

Information for patients on what to expect in the post-operative period is widely regarded as being important particularly in day-surgery patients when they have limited time to discuss their concerns with clinicians. A literature search was unsuccessful in identifying a systematic attempt to develop post-operative literature and it seems that it is often drawn up with little thought for what patients want to know and is supplemented with anecdotal evidence about what happens to patients during rehabilitation. To compensate for this weakness we designed a two-part study to (i) identify key areas of patient concern and (ii) develop consensus responses for these key concerns. We used Delphi techniques to explore the area further. In the first part we devised, validated, tested and piloted a questionnaire, which was then used to identify key areas of concern for patients in the rehabilitation period following six common general surgical procedures. The key areas were: postoperative pain, wound problems, bathing, stretching and heavy exercise, return to work, driving and sex. These areas of concern were common to all patients regardless of their operation. We then used a similar technique to approach all the consultant general surgeons in the former Northern region to ask what advice they would give in each of the key areas for an idealised 'normal' patient. Whilst many surgeons fell within a broad area of agreement, there were some who differed markedly from the others even after the views of peers were taken into account. Examples of this are a range of 7–90 days before patients could undertake vigorous exercise after a hernia repair and 1–60 days for driving after a varicose vein operation.

Keywords: Information needs; Post-operative period; Delphi techniques

1. Introduction

In May 1990 CB was consulted by a patient following a day-case inguinal hernia repair. The patient asked when he could return to driving. As CB didn't know the answer, he sought the advice of the patient's surgeon. The answer that 'he could drive once the wound was comfortable when stressed, which would probably be 2–4 weeks seemed entirely reasonable. Later that week CB saw another patient who had a similar procedure carried out in a different hospital. Because he now knew what to reply CB asked him if he needed any advice on driving. 'No, they've given me very precise details on that. On no account must I drive for three months'.

A recent report from the parliamentary commissioner for health administration has emphasised the need to provide patients and families with the necessary information about the care of the patient after discharge [1]. As short-stay or day-case surgery becomes more common, patients have less time to ask advice about rehabilitation from their surgeons. Whilst the average length of stay for an inguinal hernia repair was 4.9 days in 1985 [2] in many units it is now less than 24 h. This change has led to primary care teams accepting an increasing responsibility for providing post-operative advice. There are some doubts, however, as to whether

* Corresponding author. Tel.: +44 191 4540475; fax: +44 191 4271793.

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primary care services can provide this information with considerable variation in the advice recommended for patients having laparoscopic cholecystectomy [3] and other general surgical procedures [4,5].

The important question of whether primary care workers have the detailed knowledge of postoperative rehabilitation required to fulfil this role is unknown. A pilot study of primary care nurses in the northern region suggested that this was not the case with a wide range of advice given by different professionals to the same situation (C. Bradshaw unpublished data). Whether this is solely due to lack of knowledge on the part of primary care professionals or whether it is partly due to confusion fuelled by contradictory advice from surgeons is also not known.

It is equally important that health care professionals are aware of those areas about which patients feel they need advice to facilitate their rehabilitation. These may not necessarily be the same as those areas identified as important by professionals.

Whilst there is general agreement that each patient is different, a combination of common sense and clinical experience enables most people to understand that an obese 65-year-old is likely to take longer to recover from an operation than a slim fit, 30-year-old. Thus information about one type of patient can be adapted for another. Unfortunately, there is no agreement as to how long a fit 30-year-old is likely to take [5]. Without this, providing meaningful, individualised information is impossible. Primary care requires a core of evidence-based, postoperative information about those areas important to patients, agreed upon by most, if not all surgeons, which can then be varied for individual patients. This is not currently available but it is likely that both patients and primary care staff would welcome such information rather than a diversity of views from different surgeons.

We report the methodologies and results of two interlocking studies which identified the key areas of information needed from a patient perspective and then sought to achieve consensus on the advice to be given in each area. We finally discuss a systematic approach for the development of objective advice.

2. Method

The project included a variety of stages, which will be described in the methodology. These include the search strategy for previously published literature, the development and validation of the questionnaires, the administration of two rounds of Delphi questionnaires to patients and finally the administration of two rounds of Delphi questionnaires to surgeons.

2.1. Previously published literature

A literature search was conducted on Medline using keywords patient education, information leaflets, postoperative care and operative procedures and this identified some articles. The references quoted in these articles provided a further series of sources to check. We found further articles on information booklets for patients following discharge from medical wards and information provided to patients having a hysterectomy.

In addition we examined a sample of postoperative leaflets from more than twenty hospitals from five different health regions.

2.2. Patient questionnaire development

The project received local ethical approval. Following this a modified Delphi method was used as a suitable method for identifying patient opinions [6]. Six common procedures were chosen, representing the range of common operations performed by general surgeons [2] many of which are or could be performed as day-cases. These were inguinal hernia repair, ligation $+/-$ stripping of varicose veins, appendectomy, open cholecystectomy, uncomplicated laparotomy and mastectomy.

Two patients from each of the categories were identified from computerised records and received an unstructured interview at 3 months post-operation, to identify problems or areas of concern. From the results a semi-structured interview schedule was constructed and administered to a further six patients. The results were collated and a structured questionnaire was drawn up which was checked for 'readability' using the FOG test [7]. This was piloted on five patients to check that the questions were easy to understand and answer. Face validity was ensured by the rigorous questionnaire design.

2.3. Assessing patients opinion

2.3.1. 1 st round Delphi of patients

The final version of the questionnaire was sent to ten patients in each of the six operation categories 3 months after their operation. A letter explaining the reason for the study accompanied it. The letter was written with short sentences, no jargon and few words of more than three syllables. Patients were identified from hospital records, had all been operated on by one surgeon 3 months previously and were aged-ranged, 18–65. The questionnaire asked respondents to score twenty-one specific areas on a four point scale as to whether they had any problems or concerns in each area. As a check for internal reliability, the respondents were then asked to list those areas that had caused the

Table 1
Problems identified with hospital post-operative information leaflets

Lack of precision	An information leaflet for patients following a vasectomy said that the 3 month postoperative semen sample should be……'Collected and delivered by hand'
Jargon	A leaflet on colposcopy had one page devoted to an explanation of CIN grades. Another said that constipation following a hernia repair could be eased by a suppository which should be….'digitally inserted into the rectum'
Difficult to read	'For those who have had some difficulty understanding this leaflet, the algorithm appended below may illuminate the points previously made'

major concerns or problems. Results were collated, scoring moderate and severe problems as a positive response and slight or no problem as a negative response, checked for internal reliability and a list of key areas of concern were drawn up from those areas with the highest scores.

2.3.2. 2nd round Delphi of patients

A second questionnaire, which focused on the key areas identified by the responses to the 1st round Delphi, was developed and sent to the same patients. These key areas were explored further asking patients to differentiate between those things that caused a physical problem and those that caused worries but no actual problem. We asked if they had received information in the various areas and whether they felt that more information would have made any difference to these concerns and problems. This questionnaire was sent to the original respondents and the results collated. In the second round the respondents were asked to answer yes or no to the questions. Thus the scoring and collation of results was much simpler.

2.4. Developing a consensus of postoperative advice

2.4.1. Questionnaire development

We, once again, used a Delphi technique in an attempt to achieve a consensus amongst surgeons in the northern region about postoperative advice. A questionnaire was drawn up using an 'ideal patient'—middle aged, fit, with no problems over the peri-operative period and no problem with wound healing—who had had one of the six common operations. The surgeons were asked to give an opinion on the length of time before a patient was: pain-free, able to stretch freely, able to have a bath, able to start a normal sex life, able to start heavy exercise or hard work, able to drive. These were the key areas identified from the patient questionnaire. This was piloted on several surgical colleagues from outside the Northern region and amended in light of their comments. Consultants were identified from sources at both the old Northern Regional Health Authority and Newcastle Health Authority (which held details on all consultants working in the teaching hospitals).

2.4.2. 1st round Delphi of consultants

The questionnaire was then sent to all consultant general surgeons in the Northern region with a covering letter explaining the reason for the study. The letter was 'reader-friendly' in that we used short sentences and avoided jargon. We asked each surgeon to consider an ideal patient going through each of the six common procedures and to provide details of how long they would advise a patient that they may have problems for each of six key areas identified from the patient survey. We also asked whether they routinely gave any advice on wound infections. Several responses indicated that some surgeons were answering with respect to laparoscopic procedures. Each surgeon was subsequently contacted by phone to check whether their responses were for laparoscopic or open procedures.

2.4.3. 2nd round Delphi of consultants

Following the first round of the Delphi study the results were collated. Because of the skewed distribution, a median and range was derived for each key area and each procedure. The range of procedures was extended to cover both laparoscopic and open inguinal hernia repair, appendectomy and cholecystectomy. We then fed back this information along with their own advice in each area, and asked if they wanted to alter their advice in light of the response from their peers.

3. Results

3.1. Literature search

The Medline search produced only 24 references from 1986–95 of which only five were of any relevance for this study. Examination of the references of these articles produced another two useful background articles.

Only one of these articles set out a method by which patient concerns were systematically collected [8]. Most described only the information provided by nine professionals although one did suggest responses to patient concerns [9]. Few of the articles provided any information on how to make information leaflets

'user-friendly' although an article on general practice information leaflets goes into this in considerable detail [6].

In addition we examined a sample of postoperative leaflets from more than twenty hospitals from five different health regions. The majority were imprecise, difficult to read or filled with jargon. Examples of all three faults are described in Table 1.

3.1.1. Results of first round Delphi for patients

The response rate for the first and second rounds of the Delphi was 86%. The procedure did not seem to make a difference to patients' concerns during rehabilitation—they were the same no matter what the operation was. There were 12 key areas at the end of the first round, which were ranked and shown in Table 2

3.1.2. Results of second round Delphi for patients

The responses to the second round indicated that although there was a considerable degree of overlap between those things causing concern and those causing a problem, there were several areas which were only identified as a priority in one. Because of this the key areas for postoperative information were identified as being those causing either concern or a problem where more information would have made a difference to rehabilitation. After the second round those key areas were ranked and shown in Table 2.

Patients (75%) were given no information on sex—the majority that did get information were the mastectomy patients. About 60% did not remember receiving information on what pain to expect following discharge.

Table 2
Ranked results of 1st and 2nd round Delphi questionnaires for patients

First round
Postoperative pain
Bathing
Wound infections
Sex
Heavy work
Heavy exercise
Climbing stairs
Driving
Stretching
Standing for periods of time
Vacuum cleaning 'Hoovering'
Second round
Postoperative pain
Stretching/exercise
Wound infections
Bathing
Sex
Work and housework
Driving

Areas causing concem or problems in the 1st round and causing concern or problems and where more information would have made a difference in the 2nd round.

3.1.3. Results of first round Delphi consultants

The results of the first round Delphi are shown in Table 3. The response rate after one reminder was 62%. There is a considerable range of opinion as to when patients could undertake certain activities. For example following a varicose vein operation, the range of opinion as to when a normal sex life could be started varied from day 0 to day 38. Following an open inguinal hernia repair the range of advice a patient would receive about when to start heavy exercise again ranged from day 7 to day 90.

3.1.4. Results of second round Delphi of consultants

The response rate to the second round was 81%. There was little change in the second round results. Those where this may have some clinical significance are shown in Table 3. Some retracting of range occurred suggesting a move towards consensus but there was also some extension of range, which seems difficult to explain.

4. Discussion

It is widely assumed that it is important to give consistent information to patients especially in day-case surgery, yet the lack of consensus amongst surgeons would seem to make this diffcult. This is a problem both for nurses working on a busy day-unit with several consultants and for primary care workers who may see patients from different hospitals. It is a problem deciding how best to achieve this as, on the evidence presented here, it seems peer pressure has little influence on surgical opinion.

The design of the questionnaire was rigorous enough to suggest that we have identified the genuine concerns of this group of patients and the consistency of the themes identified would be unlikely if we were merely rehashing anecdotal evidence. We were surprised to find that the type of operation performed had little bearing on this. It would be interesting to know whether this would also apply to patients of other surgical specialities. It was less of a surprise to find that the information needs of patients were not being adequately dealt with, for example, 75% of patients given no information on sex (the majority that did get this information were, not surprisingly, mastectomy patients) and 60% who did not remember receiving information on what pain to expect following discharge. Where printed leaflets were issued there was no evidence that they addressed the concerns of the patients. As well as providing only the advice that professionals thought was important they were often badly written with lack of clarity and copious medical jargon. The advice to 'refrain from intercourse' may be grammatically correct but most South Shields patients

Table 3
The results of 1st and 2nd round Delphi questionnaires for surgeons

Type of operation	Be free of pain		Stretch		Have a bath		Have sex		Undertake hard exercise		Drive	
	Delphi 1	Delphi 2	Delph 1	Deiphi 2	Delphi 1	Delphi 2	Delphi 1	Delphi 2	Delphi 1	Delphi 2	Delphi 1	Delphi 2
Open inguinal hernia	7		10 (1–40)	(1–21)	3 (0–14)		14 (0–40)		35 (7–90)		14 (4–60)	
Laparoscopic inguinal hernia	2 (1–7)	1–14	3 (1–10)		2 (0–3)		7 (2–14)	(5–28)	17.5 7–42		7 (2–21)	(5–14)
Ligation of varicose veins	4.5 (0–21)		4.5 (0–21)		3 (0–10)		8 (0–37)		14 (1–60)		10 (1–60)	
Laparoscopic appendicectomy	2 (1–4)		4 (2–7)	(1–14)	2 (0–4)		7 (6–21)	(1–14)	11 (7–21)		7 (3–15)	
Open appendicectomy	5 (0–21)		7 (1–24)		3 (0–12)		12 (2–30)		21 (7–42)	10 (3–42)	10 (3–42)	
Laparoscopic cholecystectomy	2 (1–12)		5 (2–14)		2 (0–7)	(1–5)	7 (2–21)		16 (7–42)	(7–30)	8 (1–21)	(3–14)
Open cholecystectomy	7 (0–30)		14 (6–40)	(6–30)	4 (1–14)		14.5 (2–30)		42 (6–90)		14 (7–60)	
Mastectomy	5 (0–21)		10.5 (1–40)		4 (0–14)	(1–21)	14 (2–40)		28 (7–70)	(2–60)	14 (5–60)	
Mid-line laparotomy	8.5 (0–56)	(2–30)	14 (4–60)	(4–30)	4 (0–20)	(1–40)	21 (2–42)		35 (7–90)	(20–90)	17.5 (7–60)	

Given a normal slim healthy middle-aged patient with an uncomplicated operation, how soon (median and range in days) could the patient expect to be able to be free of pain and do the above mentioned activities.
Results for Delphi 2 questionnaire only displayed when they differ markedly from those of Delphi 1.

have sex, not intercourse and they certainly don't refrain from it—although they might not do it for a while. Often the wording seemed designed not to offend the sensibilities of the professionals as in 'digitally inserted into the rectum'.

Our decision to concentrate on information that would make a difference to rehabilitation is a pragmatic choice. The desire for information must be balanced not only against time involved for professionals but also the knowledge that most people are only able to retain limited amounts of information even when supplied with written information sheets [10]. Concentrating on those areas that affect rehabilitation seems sensible and has been shown to be satisfactory to both patients, GPs and hospital nurses in the South Tyneside FASTRAK project [11,12].

We were unable to achieve consensus about the specific advice to be given in the key areas. Perhaps consensus is not the best way of gathering this information. There is a logic to taking a similar approach to that used when identifying patients' concerns. Why rely on professional opinions when we could identify what really happens following an operation and just how quickly people do recover? We are currently undertaking a project which will identify the details of rehabilitation from a large number of patients by providing recovery diaries and regular follow-up phone contacts. Once this is finished we will be able to provide evidence which can be used to develop appropriate patient infommation in a variety of forms (e.g. leaflets, tapes, minority languages etc.) which should support and empower the patient, rather than disadvantage and confuse, during rehabilitation.

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The effect of acupuncture on pain and swelling after day case molar teeth extraction under general anaesthesia

Trevor Roy Coe

Department of Anaesthetics, Torbay Hospital, Lawes Bridge, Torquay, Devon TQ2 7AA, UK

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Abstract

Pain following third molar teeth extraction can be severe and for day case patients, pain can worsen after leaving hospital. The objective of this study was to establish whether acupuncture could reduce post-operative pain and swelling. A total of 40 patients undergoing third molar teeth extraction were randomly allocated to two groups. The acupuncture group received acupuncture before and during general anaesthesia whilst the control group received general anaesthesia alone. Visual analogue scores for pain were measured in recovery and at 2, 18 and 72 h post-operatively, together with measurement of percentage reduction in mouth opening and assessments of swelling. Visual analogue scores at 18 h were significantly reduced from 24.5 mm in the control group to 12.5 mm in the acupuncture group ($P < 0.05$). The two groups were comparable in all other measurements. The study indicates that, in this group of patients, acupuncture can be useful in reducing post-operative pain on the day after surgery.

Keywords: Anaesthesia; Dental; Surgery; Oral; Pain; Post-operative; Therapeutics; Acupuncture

Extraction of multiple third molar teeth is often associated with severe postoperative pain, trismus and swelling. In day-case patients, these symptoms can be worse after the patient has left hospital [1]. The pain can be treated easily in the immediate recovery period in hospital with analgesic drugs but these are not without side effects including nausea, vomiting and gastric irritation. Good immediate analgesia can be obtained by local anaesthetic infiltration [2]. However this will have only a short term effect, pain scores on the following morning being similar in those who have had local anaesthetic and those who have not [3].

Studies giving contradictory results have been undertaken on the use of acupuncture for acute pain relief both pre-operatively [4] and post-operatively [5,6] after molar teeth extraction. They studied extractions under local anaesthetic only and the trials were not comparable in terms of type of oral surgery or number of teeth extracted.

This study aimed to see whether acupuncture, given before and during bilateral lower third molar teeth extraction under general anaesthetic, could reduce the pain and swelling in the immediate recovery phase and the subsequent days after discharge from hospital.

1. Methods

This randomised, controlled study was approved by the local ethics committee and written informed consent was obtained from all patients. A total of 40 ASA grade 1 and 2 patients aged between 18 and 40 were studied. All patients were undergoing extraction of at least both lower third molar teeth under general anaesthesia as day cases. Although some had upper third molar teeth extracted, it was felt that the pain and swelling from straightforward upper teeth extraction was minimal compared with lower teeth extraction and would not affect the results. Patients were not included

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if they had taken analgesic drugs or received acupuncture treatment recently, or if they had contraindications to non-steroidal anti-inflammatory drugs. All patients were familiarised pre-operatively with the visual analogue pain scoring method and patient controlled analgesia. Baseline maximum mouth opening was measured as the gap between the tips of the upper and lower incisor teeth with the mouth opened as wide as possible.

All patients were premedicated with diclofenac 100 mg rectally. They were then randomly allocated into two groups. The acupuncture group received acupuncture treatment in addition to a standard general anaesthetic and the control group received the standard anaesthetic alone.

After establishing intravenous access and monitoring, acupuncture needles were inserted in that group. This consisted of four needles, one in each hand (Colon 4) in the muscle between the bases of the first and second metacarpals, and one overlying each jaw (Stomach 6) in the lower part of the masseter muscle. These points were used according to the tenets of pain relief in Traditional Chinese Medicine which require needle insertion in a meridial point locally over the painful area and a distal point connected by the energy meridian to the painful area. The needles were inserted until a dull ache was reported by the patient. Needles were then stimulated electrically at 2.5 Hz for 20 min, the intensity adjusted according to patient comfort. General anaesthesia was then induced and the electroacupuncture was maintained until the end of the operation. The needles were removed before the patient woke.

The anaesthetic technique was standardised: anaesthesia was induced with a propofol/alfentanil mixture (50 ml propofol with 4 ml alfentanil) at a rate of 600 ml h^{-1} until loss of verbal contact and eyelash reflex. Nasal intubation with a 6 mm cuffed endotracheal tube was facilitated using a small dose (0.25 mg kg^{-1}) of atracurium. A throat pack was inserted. The patient was then ventilated to normocapnia with an O_2/N_2O 1:2 mixture and anaesthesia was maintained with the propofol/alfentanil infusion, starting at 10 mg kg^{-1} h^{-1} for 10 min, decreasing to 8 mg^{-1} kg^{-1} h^{-1} for 10 min and to 6 mg kg^{-1} h^{-1} thereafter. The infusion rate was then adjusted depending on the cardiorespiratory response of the patient and their reaction to surgery. At the end of surgery, neuromuscular blockade was reversed with neostigmine/glycopyrrolate as appropriate. No local anaesthetic was used during surgery.

Surgery was performed by two surgeons using the same technique and surgical difficulty was rated for the most difficult lower tooth removed (1, simple elevation; 2, elevation with raising of muco-periosteal flap; 3, raising of a flap and bone removal; 4, bone removal and tooth division).

Post-operatively, patients were given alfentanil, using patient controlled analgesia (PCA), 1.5 μg kg^{-1} with a 3 min lockout, until pain-free and then prescribed co-codamol dispersible, two tablets as required. The co-codamol was continued at home. Ondansetron intravenously was given when the nursing staff considered it was required.

Pain scores using a 100 mm visual analogue score VAS: 0, no pain; 100, worst pain possible) were performed by a recovery nurse, who was unaware of the patient group, at time of recovery before PCA use and at 2 h. Maximal mouth opening was measured at 2 h. The recovery nurse recorded the timing and amount of analgesic administration and the requirement for antiemetic. At discharge, the patients were given a questionnaire which involved pain scoring, measuring mouth opening and subjective assessment of swelling on the next morning and 48 h later. Total dose of co-codamol taken was also recorded together with a subjective assessment of overall recovery.

Statistical analysis was performed using t-tests for independent samples and Mann–Whitney U-tests for non-parametric data. Results were considered statistically significant when $P < 0.05$.

2. Results

All 40 patients returned their questionnaires by post. The two groups were comparable for demographic data and operative and anaesthetic characteristics (Table 1).

No significant difference was found between the groups in post-operative consumption of PCA alfentanil or time to first dose. Subjects in the acupuncture group had a mean of 3.7 doses of alfentanil (SD 2.32) with a mean time to first dose of 6.56 min (SD 4.12). Subjects in the control group had a median of 2.75 doses of alfentanil (SD 3.11) with a mean time to first dose of 8.19 min (SD 5.65).

Table 1
Patient data and operative details (mean (SD or range) or number)

Patient data	Acupuncture	Control
Sex (M/F)	7/13	6/14
Age (year)	23.8 (18–35)	25.7 (18–36)
Body mass index	23.4 (2.64)	22.46 (3.52)
Number of teeth extracted (2/3/4)	0/3/17	4/3/13
Difficulty of surgery		
1	9	7
2	3	5
3	6	7
4	2	1
Length of anaesthesia (min)	18.55 (7.93)	19.6 (6.83)
Induction dose of propofol/alfentanil (ml kg^{-1})	0.27 (0.048)	0.28 (0.046)
Average infusion rate of propofol/alfentanil (ml kg^{-1} h^{-1})	0.97 (0.17)	0.96 (0.21)

Table 2
Median visual analogue scores (range) in mm

Time (h)	Acupuncture	Control
0	22 (0–65)	27.5 (0–61)
2	19 (0–42)	23.5 (0–72)
18	12.5 (0–38)*	24.5 (0–78)
72	5 (0–37)	14 (0–71)

* $P<0.05$.

The visual analogue score was significantly lower in the acupuncture group at 18 h ($P < 0.05$), but there was no difference in VAS between the groups at the other times (Table 2). There was no difference in consumption of cocodamol between the groups, with a mean of 12.75 tablets (SD 6.65) in the acupuncture group and 14.95 tablets (SD 8.85) in the control group.

No significant difference was found in the percentage reduction in mouth opening between the two groups, the values at 2, 18 and 72 h being 34% (SD 23), 31% (SD 22) and 22% (SD 20) in the acupuncture group and 30% (SD 21), 35% (SD 23) and 32% (SD 25) in the control group. The subjective assessment of swelling by the patient is shown in Table 3 and the subjective rating of overall recovery post-operatively is shown in Table 4. The sample size was too small for meaningful statistical analysis of these data.

No significant difference was found in the incidence of nausea between each group, with ondansetron needed in one patient in the acupuncture group and three patients in the control group. All patients were reviewed by the surgeon at 2 weeks and there were no serious post-operative complications.

3. Discussion

In this study acupuncture significantly decreased pain compared with the standard postoperative analgesic regime only on the morning after surgery, with no significant effect on pain at other times. Post-operative pain control is probably most important during the first 24 h as the pain is most likely to be intense in this period. The decrease in pain at 18 h was from a median visual analogue score of 24.5 mm in the control group to 12.5 mm with acupuncture. This represents a 49% reduction which is of clinical significance even though the pain score was already quite low [7].

Studies have shown high blood endorphin levels whilst acupuncture is in progress and in the first few hours after treatment [6,8] and that acupuncture has a good analgesic effect at this time [5]. This study did not provide evidence to support this. It is likely that alfentanil blood levels from the anaesthetic were still quite high at the recovery time and perhaps no difference between the groups would be expected due to this method of anaesthesia.

Patient comfort is one of the criteria for discharge from the day case unit and this study showed no difference between the groups at the 2 h time of discharge. With the availability of analgesia in the form of alfentanil and co-codamol during these 2 h, it is probably unsurprising that the pain scores were similar.

At 72 h the actual pain scores were already low (median 14 mm in the control group) and any further statistically significant reduction in pain score would probably not be clinically significant [7].

Acupuncture is known to increase blood cortisol levels [8]. It was thought that this may diminish the swelling after surgery as studies have shown that steroids can decrease pain and swelling after third molar extraction [9,10]. The evaluation of swelling after teeth extraction is difficult. Although precise measurement of swelling has been attempted using an oedemometer [11] or stereophotogrammetrically [12], these methods would have been impractical for the day patients in this study. As these were day-case patients it was not possible for an observer to perform subjective evaluations of swelling and so assessment by the patient, relating swelling to that on the previous measurement day was used. This subjective assessment of swelling by the patient produced similar results in each group but the sample size was unfortunately too small to draw any statistical conclusions. In one study of swelling after oral surgery [13], it was found that peak swelling was measured on the third day after surgery which was not confirmed in this study.

Swelling itself is only a cosmetic nuisance to the patient whereas trismus can limit normal function such as eating. Trismus results from operative pain and swelling causing protective spasm in the muscles of mastication and can be measured by reduction in mouth opening. Although this study failed to demonstrate any effect of acupuncture on mouth opening at each measurement time, maximal trismus was observed on the first post-operative day in the control group in line with another study [12], whereas in the acupuncture group it was maximal at 2 h.

There is probably a significant psychological aspect in the success of acupuncture. No attempt was made in this study to blind the patient to remove any placebo effect of acupuncture. An investigation of acupuncture placebo [14] failed to show any significant differences between ‘true acupuncture’ and ‘placebo acupuncture’, but there is a big problem in finding an unequivocal placebo treatment for controlled trials [15]. Either you insert a needle into the patient, in which case you are giving acupuncture, or you do not; and if you do not, it will not be an equivalent form of treatment to acupuncture. Insertion of needles once the patient is anaesthetised would not be appropriate if following

Table 3
Subjective assessment by patient of swelling showing number of patients with swelling and a comparison of this swelling with the previous assessment

Time		Swelling present	Swelling compared with previous assessment		
		More	Similar	Less	
2 h	Acupuncture	20	—	—	—
	Control	20	—	—	—
18 h	Acupuncture	16	10	5	1
	Control	18	13	4	1
72 h	Acupuncture	16	2	3	11
	Control	16	4	3	8

Traditional Chinese methods requiring patient feedback of needle sensation [16]. The purpose of this study was to investigate the overall effect of acupuncture as compared with the standard analgesic regime. If some of this effect is psychological, it is still an important, integral part of acupuncture treatment in the same way that the positive psychological effect of preoperative reassurance is an integral part of anaesthetic practice. Any positive patient bias towards acupuncture would have been eliminated by the randomisation of patients between the two groups.

The sample size in this study was limited by the number of suitable patients over the 18 month period of the trial who were willing to undergo acupuncture treatment. This is one of the problems with using acupuncture-many people do not like needles despite them being very fine gauge and painless on insertion. It is possible that a greater analgesic effect could have been obtained with the insertion of more needles around the jaw according to Traditional Chinese methods [16]. However this would probably have been more unacceptable to patients and therefore the local point over the lower third molar was chosen as the most valuable acupuncture point. The power of this study was approximately 55% and although this is not high, a significant decrease in pain score on the first post-operative day was achieved. I would suggest that this demands further investigation as randomised, controlled trials in this area of medicine are sadly lacking.

In conclusion, acupuncture treatment in the pert-operative period can reduce the pain on the day after operation in day-case patients undergoing lower third molar teeth extractions. Although it is a time consuming procedure on a busy day-case list, further investigation of its effect may find a more practical solution for using this non-toxic method of pain relief.

Table 4
Subjective assessment by patient of overall recovery from surgery (number of patients)

	Excellent	Adequate	Fair	Poor
Acupuncture	6	9	5	0
Control	4	7	6	3

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Case report

Convulsions associated with postoperative abstinence from alcohol

S.S. Aslam, V.G. Punchihewa *, S.F. Tinloi

Department of Anaesthesia, Basildon and Thurrock NHS Trust, Basildon, Essex SS16 5NL, UK

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Abstract

A 37 year old Caucasian male with known alcohol dependence, was anaesthetised for the repair of a paraumbilical hernia on a day stay basis. On discharge he was instructed not to drink alcohol for 24 h. The patient developed acute alcohol withdrawal symptoms within 48 h. Alcohol abuse is a common problem. Patients with this problem occasionally present to the day surgery unit for short surgical procedures under general anaesthesia or sedation. These procedures are, often carried out in the day unit, as long as the patient has no physical problem attributable to alcohol. However, there is a potential for some patients to develop alcohol withdrawal symptoms. These can be serious, as there is, in the majority of cases, no mechanism for the early detection of the withdrawal symptoms and signs. We report a case of postoperative convulsions associated with alcohol withdrawal following the repair of a paraumbilical hernia on a day stay basis. We present a short review of related literature.

Keywords: Alcohol; Withdrawal; Day case; Postoperatively

1. Case history

A 72 kg, 37 year old Caucasian male was scheduled for repair of a paraumbilical hernia in the day surgery unit. On preanaesthetic assessment, he admitted to an intake of 12 units of alcohol per day. There was nothing else remarkable in the history and examination: notably an absence of clinical signs of liver and other alcohol related disease.

Anaesthesia was induced with a total of 300 mg of propofol and a size four laryngeal mask was inserted. Anaesthesia was maintained with a mixture of oxygen, nitrous oxide and isoflurane. Analgesia was supplemented with 100 mcg of fentanyl, 100 mg of rectal diclofenac and wound infiltration with 10 ml of 0.5% plain bupivacaine. Anaesthesia, surgery and postoperative recovery were uneventful. The patient was discharged home, escorted by his wife, with routine day unit postoperative instructions.

The patient had two generalised fits, 36 h after discharge. He was brought to the 'accident and emergency' department of our hospital and a diagnosis of acute alcohol withdrawal convulsions was made. He was kept on the observation ward for 12 h. As no further convulsions were observed, he was discharged with an urgent referral to the psychiatry department for further management of alcohol related problems.

2. Discussion

There are an estimated 300000 persons with alcohol related problems in the UK [1]. The incidence among males is 5% and among females is 2% [1]. The figures quoted by other sources for the western countries are 10% for men and 3–5% for women [2]. Alcoholism is seen in all races, ethnic groups and socio-economic strata. Among an average of 2000 patients on a general

* Corresponding author.

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practitioner's list, 100 are heavy drinkers, 40 are problem drinkers and 10 are physically dependent on alcohol [1]. Males who drink more than 36 units of alcohol per week and females who drink more than 24 units of alcohol per week are considered to have an alcoholic problem and damage to health becomes increasingly likely [1].

The diagnosis of alcoholism is, in practice, difficult to make. It is not solely, dependent on the units of alcohol drunk; indeed, heavy drinkers often do not say how much they are actually drinking. Furthermore, it is not the heavy drinkers per se who are at risk of developing problems following sedation or anaesthesia, but the ones who have alcohol related systemic problems or who are physically and psychologically dependent on alcohol. If there is evidence of systemic damage (e.g. liver or heart disease) the diagnosis is easy, but these manifestations occur quite late. In the absence of overt clinical features, there has to be a high index of suspicion or one has to rely on the social history. Marital problems, job problems, arrests, if in relation to alcohol, are significant pointers.

A popular index used to diagnose alcohol-related problems, in psychiatry, is the CAGE questionnaire [1], which asks:

- Have you ever felt that you ought to CUT DOWN on your drinking?
- Have people ANNOYED you by criticising your drinking?
- Have you ever felt bad or GUILTY about your drinking?
- Have you ever had a drink, first thing in the morning (EYE OPENER), to get rid of a hangover?

Two or more positive replies are needed to identify problem drinkers. This is probably an easier method to identify the at risk group of drinkers.

As the information obtained from the patients and their relatives is often unreliable, highly specific biochemical markers like carbohydrate deficient transferrin have been used in an attempt to identify problem alcoholics [3].

The alcohol withdrawal syndrome is characterised by cortical (behavioural) and adrenergic hyperexcitability [4]. Mild signs begin within 5–10 h of abstinence. These include tremors of the hand (shakes or jitters), autonomic nervous system dysfunction such as increase in pulse rate, respiratory rate, body temperature, insomnia, bad dreams, feeling of generalised anxiety or panic attacks and gastrointestinal upset. 5% show severe withdrawal symptoms, which include confusion, and visual, tactile or auditory hallucinations. A small percentage show fits (rum fits) within 48 h of stopping alcohol. Generalised convulsions usually occur singly but sometimes in short runs or as status epilepticus [4].

Delirium tremens represents the most serious type of alcohol withdrawal. The patient is disoriented, agitated, hallucinating, tremulous and perspiring. His pulse and respiratory rate are rapid. The other signs include confusion, severe agitation and psychosis.

Corticosteroids increase the severity of acute withdrawal from alcohol [5]. The question that remains unanswered is the role of endogenously secreted corticsol, following the stress of surgery and anaesthesia, in mediating the withdrawal symptoms. The most worrying of the withdrawal features are the, central nervous system, manifestations.

Early recognition of withdrawal signs is the key to treatment. Benzodiazepines, especially diazepam and chloriazedpoxide are the mainstay in treating alcohol withdrawal, including convulsions and delirium tremens [6]. The usual dose of diazepam is 5–10 mg 4–6 h orally and 50–100 mg of chlordiazepoxide 4–6 h orally for several days followed by gradually tapering doses. For sever withdrawal symptoms larger doses of the above are needed. Thioridazine, haloperidol and chlormethiazole can also be used. Chlormethiazole is an extremely useful and flexible drug in the management of acute withdrawal [7]. It is not a treatment for alcohol abuse and should not be used in this patient group, other than in the withdrawal period, and then, for less than 10 days [7]. Generalised frequent seizures require aggressive pharmacological intervention in the form of intravenous anticonvulsant (e.g. diazepam or phenytoin).

Other agents have also been used in the 'acute alcohol withdrawal' syndrome. Clonidine, an adrenergic alpha 2 agonist, has been used as a supplement in the treatment of acute withdrawal syndrome [8–10]. Beta-blockers, may play a role as an adjunct to, but not a replacement for, anticonvulsant therapy [11].

Studies suggest that the serotonin uptake inhibitors such as zimelidine, and fluoxidine may reduce alcohol consumption [6]. Naltrexone, an opiod antagonist, may also be effective in reducing the urge to drink [6]. Nitric oxide related agents might alter alcohol withdrawal symptoms. Adult male rats treated chronically with alcohol and subjected to a (NG-nitro-L-arginine methyl ester, NAME) injected during alcohol withdrawal. This drug significantly inhibited withdrawal severity. The nitric oxide donor, isosorbide dinitrate (ISDN) administered during alcohol withdrawal significantly increased the severity of most withdrawal signs [12]. We do not know if this means that alcohol withdrawal manifests more easily in patients who are on ISDN.

There is clearly no doubt that a number of people suffering from alcohol related problems present for surgery. The experience of most anaesthetists in dealing with them is as inpatients. Subjecting such patients to short surgical procedures on a day stay basis can be risky as they are discharged back to the community where early detection of alcohol withdrawal symptoms is not always possible. Admitting all such patients

post-operatively, following short surgical procedures performed under general anaesthesia or sedation is not the answer. The manifestations of 'acute alcohol withdrawal' can develop, as late as 48 h postoperatively.

3. Conclusion

We think that alcohol dependent patients can still be managed as day cases. But we must have a better system of identifying the 'at risk' group. Above all, we feel that the blanket advice given to all day cases about not taking any alcohol for at least 24 h postoperatively is wrong. If a patient is likely to be a problem drinker, we should allow the patient to have an alcoholic drink as so on as he/she feels the urge for it.

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