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Experience of a hospital hotel

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Abstract

Hospital hotels are uncommon in the United Kingdom. Kingston Hospital opened one in July 1991. In the first 3.5 years, 4540 guests have stayed there with high satisfaction rates. It has enabled in-patient average length of stays to be contained in the face of increasing day surgery and allowed 2132 patients to undergo day surgery who would otherwise have required admission. The cost per day in the hotel is just over a third of the cost of an in-patient stay with the median length of stay being just under 3 days. Of the guests, 1.2% had to be re-admitted to the in-patient unit and 0.1% died in the hotel.

Keywords: Hospital hotel; Day surgery; In-patient beds

1. Introduction

One of the first hospital hotels in the United Kingdom was opened at Kingston Hospital NHS Trust in July 1991. The aims of the hotel are, firstly, to increase the number of patients that can benefit from day surgery or same day diagnostic procedures and, secondly, to obtain a more efficient use of acute in-patient beds and thus reduce waiting lists. The hotel achieves this by providing a domestic level of support to patients who would be suitable for day surgery or for discharge from acute hospital beds if their home situation was more favourable.

1.1. The facility

An empty ward was converted to an hotel in 8.5 weeks at a cost of £60 000. This provided twelve single cubicles and four single rooms, the majority without en-suite bathroom facilities but all with an hotel bed, television, a wardrobe and an armchair. Lounges, a dining room, an office, a small kitchen and storage were included in the development. The guests are looked after by two stewards/stewardesses during the day and one at night. These are not required to have any formal nurse training. Their role is to act as a surrogate family for the guests.

Nursing care is provided, as if the patient had gone home, by community nurses who are mainly pre-booked prior to the guests entry into the hotel.

Medical advice when required is given by senior house officers of the appropriate speciality who undertake the role of the guest's general practitioner. There are no regular medical rounds of the hotel.

1.2. The guests

Guests in the hotel have been discharged from hospital and all discharge procedures have been completed including any follow-up appointments, the dispensing of discharge medications and instructions to the patients on self-medication. Hospital notes do not accompany the patient to the hotel, but they do have a copy of the discharge letter to the general practitioner and any community nursing instructions. In essence, patients discharged to the hotel are treated identically to those discharged home.

Guests must be booked into the hotel at least 24 h prior to their entry with the referring consultant stipulating admission and discharge dates. The aim is to limit stays to a maximum of 3 days.

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Patients suitable to become guests in the hotel are in-patients who are unable to return home and potential day surgery cases who cannot have this form of treatment because of social reasons (see Fig. 1). The hotel may also be used for day surgery patients who live more than 1 h drive from the day unit and would otherwise need to be treated as in-patients. Patients excluded from using the hotel are listed in Fig. 2.

2. Results

2.1. Activity

In the 3.5 years since its opening, 4540 guests have stayed in the hotel, 2892 (63.7%) were female and 1648 (36.3%) were male. The majority (72.6%) were over 65 years of age. Median length of stay was 2.9 days (range 1–9 days) and the percentage occupancy rose from 60.1% in 1991/1992 to 91.53% for the first 6 months of 1994/1995. General surgery, general medicine and ophthalmic surgery each accounted for over 25% of the referrals to the hotel, with gynaecology and orthopaedics each about 10%.

The percentage of guests who were day surgery patients rose from 26.7% in 1991–1992 to 61.9% for the first 6 months of 1994–1995 with a percentage for the 3.5-year period of 47% (2132 patients). Of patients in the first year, 32% were referred for community nursing visits but this fell to 9.9% in the first 6 months of 1994–1995.

2.2. Complications

Fifty four (1.2%) of the guests have been re-admitted over the 3.5 years and this percentage has not varied significantly in any year. The re-admission rate of the day surgery cases was 0.28% and of those transferred from the in-patient unit 1.99%; 70% of the latter were general medical cases.

Five guests died during their stay in the hotel. Four of these were females over the age of 76 years who had been in-patients with cardiac problems. Resuscitation was attempted in each case. The fifth death was a male with lung cancer. All deaths were unpredictable at the time of transfer to the hotel.

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Absence of family or friend at home.
Lack of access to a telephone.
No indoor toilet or bathroom.
Lack of functioning lifts in
upper floor accommodation.
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Fig. 1. Social reasons for hotel admission.

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Patients requiring acute medical or
nursing care.
Elderly patients requiring long-term
convalescence.
Psychiatric patients.
Patients unable to self medicate.
Children, other than new born with
nursing mother.
Patients who are immobile or not
substantially self-reliant.
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Fig. 2. Patients excluded from the hotel.

2.3. Acceptance

Guest satisfaction was monitored by questionnaire with a return of 87%: 88% described the hotel as excellent and 11.8% as good.

2.4. Cost

The cost of a guest staying in the hotel is £41 a day compared to an average of £112 on an in-patient ward. This in-patient cost excludes the cost of laboratory tests, X-rays, operating theatres, physiotherapy and pharmaceuticals.

2.5. Impact on hospital activity

The hotel has helped in allowing the hospital to reduce its in-patient beds from 424 prior to its opening to 349 in the last full year, 1993–1994. Despite a 4.9% reduction in the lighter in-patient work in this time, the overall hospital average length of stay has reduced by 15.5% from 6 to 5.07 days.

The clearest benefit is seen in day surgery. In 1991–1992, the hotel allowed the hospital to undertake 2.8% more day surgery, in 1992–1993 7.2% more, in 1993–1994 6.7% more, and in the first half of 1994–1995 9.6% more.

3. Discussion

Hospital hotels providing the level of accommodation and support equivalent to good home circumstances and care from competent relatives or friends have existed and been been successful in the U.S.A. for a number of years [1]. In the United Kingdom, they are a new concept but can be equally beneficial allowing an earlier discharge of in-patients and an increase in day

surgery for those patients with inadequate home support. The improved ambience and comfort over in-patient wards makes it attractive to the guests who use it and its cost effectiveness benefits the hospital budget.

The hotel at Kingston Hospital, as in the U.S.A., has helped to contain costs, reduce in-patient beds, control the average length of stay despite increased case complexity, and increase day surgery whilst at the same time being most acceptable to patients.

The re-admission rate for day cases of 0.28% is in line with that reported from Kingston Hosptial for patients sent home following their day surgery (0.3% for hernias [2], 1.4% for all day surgery [3]). However, the readmission rate of 1.99% of in-patients transferred to the hotel could be improved. Many of these came about because referral criteria were not followed particularly at times when there was pressure on in-patient beds. Continuous audit of referrals and re-admissions together with appropriate action by the hotel management is essential to prevent abuse of the hotel facility. The deaths in the hotel were unpredictable. All these patients were stable and had been assessed by a consultant physician prior to their transfer to the hotel. They would have been sent home if their home circumstances had permitted.

In Sweden and the U.S.A., the basic concept of the hospital hotel, with no medical rounds and no nursing staff, is increasingly being lost [1,4]. In both countries, many hotels have 24-h nursing staff! Recovery inns being built adjacent to freestanding ambulatory centres in the U.S.A. also have medical staff in attendance. These inns have been developed for commercial reasons to allow short stay as well as true day cases to be dealt with in the ambulatory centres. When nursing and medical care are added to a hotel the result is, at the least, a minimal care ward and the hotel ambience for the patients is lost and cost containment becomes marginal [4].

The hotel at Kingston Hospital, run by non-nursing staff, has found wide acceptance amongst its guests and the hospital staff. Its success has led to plans to build a new 30–40-bed hotel at the hospital in the near future.

4. Conclusion

Three and a half years experience of a hospital hotel in a district general hospital has demonstrated the benefits such a facility can bring by helping to contain average in-patient length of stay and by increasing the amount of day case surgery. Hotels are cost effective and can be run safely, with good patient satisfaction rates, by stewards and stewardesses without 24-h nursing or medical rounds.

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A follow-up study of the postoperative period at the hospital in patients scheduled for one-day surgery

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Abstract

During a period one-day patients were followed concerning pain and nausea during their stay at the hospital. The majority of patients were subjected to arthroscopic surgery of different joints. General anaesthesia was used in 71 patients, spinal anaesthesia was performed on 22 patients and local anaesthesia on 89 patients. One hundred and ten patients received NSAID's and 47 patients had paracetamol as premedication, whereas 14 patients had anxiolytic premedication and 13 patients had antiemetics preoperatively. There were no differences between age, type of surgery and type of anaesthesia with regard to pain postoperatively. In the postanaesthesia care unit, ketobemidone i.v. was the drug of choice and in four patients complemented with ketorolac i.v. At the day surgical unit, orally-given paracetamol and dextropropoxyphene were the drugs used. However, ketobemidone had to be orally administered in 40 patients in order to achieve pain scores less than four. In the majority of the patients, the described pain management was sufficient, resulting in pain scores <4/10 (VAS). Nausea and vomiting were minor problems. One patient was admitted over night due to severe pain.

Keywords: Analgesia; Daysurgery; Nausea; Pain; Postoperative

1. Introduction

Day surgery is now established in most Western countries. Low costs have been one of the major motives for this kind of surgery, but attention has lately also focused on good patient care, low complication rates and high acceptance of the service by the patients. In a decreasing economy, day surgery has become more and more important and consequently generated a possibility to allocate or cut resources for medical use.

Of fundamental importance is that the care delivered is of a high quality. Information about what has been done, by whom and how it has been done is crucial. Consequently, you need data describing your unit. Quality control will make it possible to improve and reform the daily work at the unit, such as pain management and treatment of nausea and vomiting. Other parameters such as how many patients do not attend, how much of different drugs are wasted also have to be notified and measured accordingly to improve these issues to a set standard [1]. Since there is a focus on costs and utility today, there is a risk that subjective

Table 1
Demographic data

Number of patients	*183*
Age (median and range)	35 (8-80)
Sex (M:F)	107:76
Type of surgery	
Orthopedic	
Knee	117
Shoulder	13
Other	12
General surgery	
Inguinal hernia	13
Varicose veins	4
Porth a cath	8
Other	16

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Table 2
Number of subjects subjected to various types of anaesthesia with respect to main surgical procedure

Type of surgery	*Type of anaesthesia*		
	Local anaesthesia	*Spinal anaesthesia*	*General anaesthesia*
Orthopedic surgery (n = 142)	72	12	58
General surgery (n = 41)	17	11	13
Total number	89	23	71

aspects on surgery, and most importantly, from the patients' point of view, such as pain and well-being are down-prioritized and forgotten.

At our day surgery unit urology, orthopaedic, general and plastic surgery are represented. Urological and plastic surgery patients were excluded due to small numbers. We decided prospectively to study orthopaedic and general surgery patients at our unit during a period of 4 weeks with respect to pain, nausea, premedication, and how much analgesics were used before leaving the hospital. We were interested in how these drugs were used related to surgery, type of anaesthesia and age. We have been especially interested in pain management, to find out the position of our management related to a set standard. Our hospital has a set standard or aim for postoperative pain management. Pain intensity measured with the visual analogue scale (VAS) should not exceed 4/10 or 40/100 at any time postoperatively. An effective management of pain at the hospital is of fundamental importance and, what is more, the foundation to allow the patients a decent postoperative period at home.

2. Methods

2.1. Patients

The present period includes the results from 183 consecutive orthopaedic and general surgery patients operated on at the day-care unit at our hospital during 1 month, Table 1. The orthopaedic group consisted of 142 patients, and general surgery group involved 41 cases during this observation period. The main reason for surgery was orthopaedic problems localized to the knee joint, 117 patients. Eighty nine patients were operated on under local anaesthesia (Table 2). When general anaesthesia was employed, propofol as anaesthetic drug and alfentanil as analgesic drug were used. Lidocaine 5% with glucose 8% was used for spinal anaesthesia and the drug of choice for local anaesthetic knee arthroscopy was prilocaine 0,5% with adrenaline. We used our anaesthesia and postoperative records for this study. Pain intensity was measured with the visual analogue scale (VAS). The VAS consisted of a 10 cm long horizontal line equipped with the words 'no pain' and 'worst pain ever', at the left and right hand extremes, respectively. The patients were asked to use the VAS at the end of their stay at the post-anaesthesia care unit (PACU) (resulting in pain measurements within 1 h following surgery) and at the ambulatory unit (pain measurement at 2–6 h postoperatively). Opioids, NSAID's and other analgesics used were used according to routine and were recorded. Premedication and antiemetic drugs were documented in the same way. For each patient, the consumption of different drugs was registered. Age, sex, type of anaesthesia and surgery were also noted. All recordings were made directly following surgery at PACU/ambulatory unit and until discharge from the hospital. All data were collected prospectively. During this observation period, the same anaestesiologist and the same nurses at the day surgery unit were working.

3. Results

3.1. Premedication and anaesthesia

A majority of the patients 163/183 (90%) received premedication, 110 patients were administered a NSAID drug (diclofenac 50–100mg) rectally and 47 patients received paracetamol 1 g rectally, whereas 29 patients needed anxiolytic or antiemetic treatment (Table 3). The type of NSAID's used did not vary significantly among patients subjected to various types of surgery. Anxiolytics as a premedication was given to

Table 3
Type of premedication given to patients

Type of premedication	*Number of patients*
Anxiolytics	
Midazolam	14
Analgesics	
Diclofenac	110
Paracetamol	47
Antiemetics	
Metoclopromide	13
Number of patients not receiving premedication	20

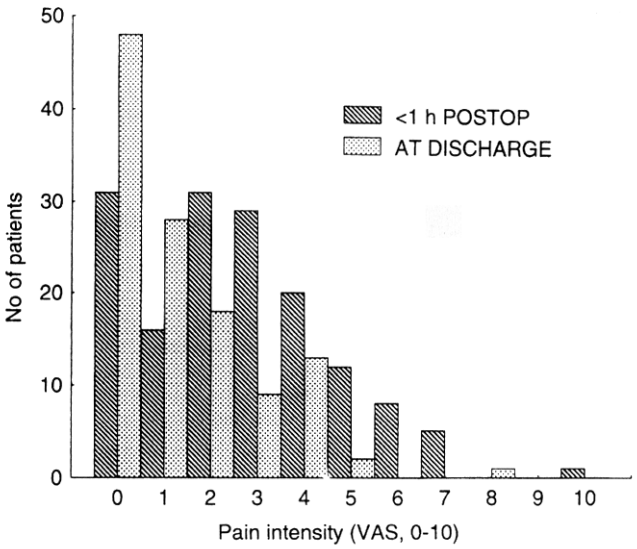

Fig. 1. Number of patients reporting a certain pain intensity postoperatively at the PACU and at discharge from the hospital. Pain intensity measured with the VAS (100 mm), recoded into a 0–10 scale.

subjects receiving local/spinal anaesthesia (8/14) as well as to those receiving general anaesthesia (6/14), but only to a limited number of all patients (14/183). Administration of antiemetic drugs was performed in 13 patients. The anaesthetic techniques used were local anaesthesia, spinal anaesthesia or general anaesthesia (Table 2). Due to the nature of surgical procedures included in the material, local and general anaesthesia were used in a majority of patients and in comparable proportions (Table 2). A significant number of orthopaedic cases (117/142) included knee joint arthroscopic diagnostic and/or surgical procedures and local anaesthesia was most often the main technique used in these instances (72/117). General anaesthesia was the dominating technique in orthopaedic shoulder surgery. Spinal anaesthesia was mainly used in those operated on due to inguinal hernia repair, varicose veins and in a minority of the patients subjected to knee surgical procedures (8/117).

3.2. Postoperative pain and use of analgesics

Pain intensity was recorded from the first hour postoperatively until discharge from the day-care unit. All patients reported a significantly higher pain intensity early postoperatively [VAS mean 2.6 (2.28–2.92; 95% confidence interval (CI))] as compared to at discharge [VAS mean 1.3 (1.07–1.64; 95% CI)] (Wilcox, $P < 0.0001$), Fig. 1. This was true also when specifically considering age and type of surgery, the latter illustrated in Fig. 2A and B. Pain intensity did not differ significantly with respect to type of surgery or anaesthesia as well as age, during the early postoperative period or at discharge. It should, however, be noted that 54/71 patients subjected to general anaesthesia also received local anaesthesia infiltrated into the wound at the end of surgery. Analgesics of varying kinds was used postoperatively (Table 4). The majority of patients received paracetamol and dextropropoxyphene in combination orally. To a lesser extent, more potent opioids were used, dominated by ketobemidone. The median ketobemidone doses i.v. and orally were 2.5 mg (max 5 mg) and 5 mg (max 10 mg), respectively. Alfentanil was used i.v. in six cases early postoperatively due to intense pain (5 cases 0.25 mg and 1 case 0.65 mg). No significant difference in need for analgesics was detected with respect to type of surgery, anaesthesia or age.

3.3. Postoperative nausea

Only seven patients experienced mild nausea, not needing antiemetic drugs, and no patients vomited during their stay at the hospital. Five of the patients were males. One patient had prophylactically received antiemetic drugs and one patient was administered opioids after the surgical procedure. Three patients had spinal anaesthesia, three had general anaesthesia and one patient had surgery under local anaesthesia. No patient was admitted due to nausea and vomiting.

4. Discussion

The patient is supposed to go home 3–4 h after completed surgery, in a good condition with postoperative pain under control, when scheduled for ambulatory procedures. A well-balanced programme for pain relief is necessary to obtain this goal. Adequate doses of analgesic drugs without creating nausea and tiredness have to be titrated for successful pain treatment permitting discharge of the patient.

In the present investigation, almost every patient received diclofenac or paracetamol preoperatively to secure a base for analgesia and the discussion on preemptive analgesia has also influenced us to start giving these drugs already preoperatively [2–4] although recent data are less convincing [5].

Patients operated on in general- or spinal anaesthesia were transferred to PACU for postoperative care. In the PACU only i.v. administration of opioids was used and ketobemidone was the first drug of choice. We administered 2.5–5 mg of ketobemidone i.v. in patients needing analgesics to avoid nausea and tiredness. If 5 mg of ketobemidone was not sufficient, ketorolac 15 mg i.v. was tried. Only three patients needed supplementation of ketorolac. Consequently, a standard program of analgesics, 2.5–5 mg of ketobemidone i.v. was given at PACU and followed by paracetamol and dextropropoxyphene orally given at the ambulatory unit

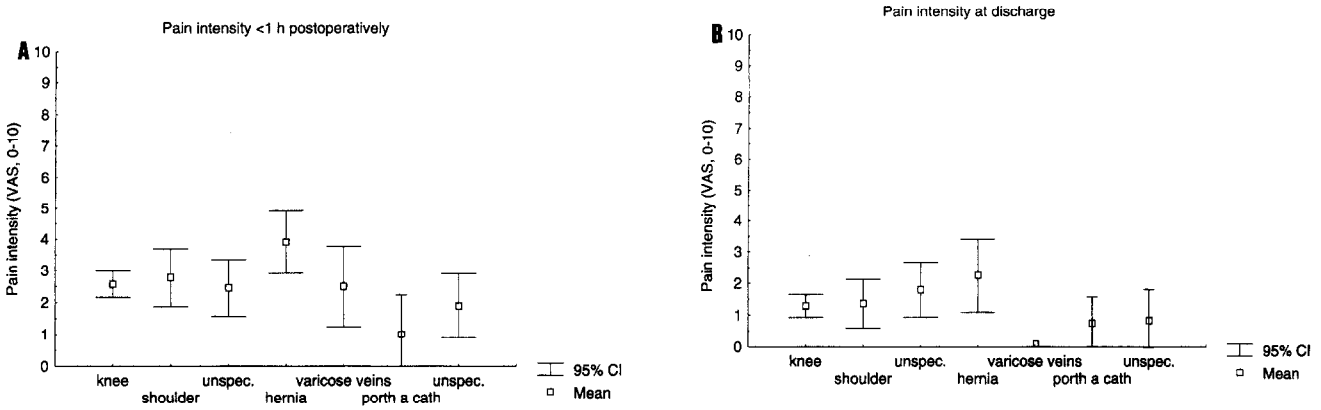

Fig. 2. (A) and (B) Pain intensity in patients subjected to various types of surgery. Mean pain intensity with 95% confidence interval represented by whiskers.

was, in the majority of cases, quite enough. Patients operated on under local anaesthesia (the majority of these cases (117) were knee joint arthroscopy) arrived directly to the ambulatory unit and sometimes these patients developed severe pain postoperatively. The regime used was alfentanil 0.25–0.5 mg i.v. and at the same time ketobemidone 5 mg–10 mg and paracetamol 1000 mg was given orally. This programme was efficient and most patients scored 2–3 on the VAS after a few minutes due to alfentanil and then when ketobemidone started to work, pain intensity continued to remain between 2–3. Only six patients, however, had to be treated with alfentanil in the ambulatory unit. We aggressively combat pain, and the patients rated pain intensity using the VAS immediately after arrival to the ambulatory unit and patients were given tablets of analgesics within minutes after arrival, if pain intensity exceeded 3/10. Our results indicate that orally-given analgesics using NSAID's and weak opioids are effective in clinical routine in the types of surgery presently studied.

Pain management in the hospital is not really a problem. A patient in severe pain is treated accordingly and aggressively and, if necessary, a stay over night in the hospital is arranged. During the month of observation for the present investigation, however, only one patient was admitted which corresponds with other studies with an unanticipated admittance of about 1% [6–8]. A successful treatment of pain may also diminish the risk to develop nausea and vomiting. Jacobsson et al. noted a positive relationship between pain and postoperative nausea and vomiting [9]. However, others have not found any correlation between pain and vomiting in patients undergoing knee joint arthroscopy [10], a finding supported by our data. Our pain intensity values are, however, relatively low which perhaps influences the relationship between pain and nausea/vomiting.

Table 4
Type of analgesics given to patients postoperatively

Type of analgesics	*Number of patients*
NSAID's	
Ketorolac	4
Paracetamol	124
Opioids	
Alfentanil	6
Dextropropoxyphene	127
Ketobemidone	
inj	41
oral	40
Morphine	8
Pethidine	2
Patients not receiving analgesics postoperatively	0

Nausea was in fact a minor problem, since only seven of our patients experienced mild nausea, although this condition is one of the major reasons for unanticipated admittance [6]. Other investigators report, regarding inpatients, nausea and vomiting in 20–40% of the patients [11]. A careful interview of the patients is recommended and appropriate measures taken when increased risk exists such as earlier experience of nausea and vomiting in connection with surgery, motion sickness and certain types of surgery. Propofol is our drug of choice for general anaesthesia and one advantage of propofol is its' antiemetic quality [12,13]. Alfentanil when used, of course, increases the risk for nausea and vomiting [14]. Only one of our patients experienced nausea in spite of preoperatively given metoclopramide and only one patient feeling nauseous had been administered ketobemidone during the postoperative period. Out of the seven patients experiencing nausea, three had spinal anaesthesia, three had general anaesthesia and one patient had surgery under local anaesthesia. Other authors report an advantage of regional anaesthesia compared to general anaesthesia concerning nausea/vomiting [15]. Factors favouring regional anaesthesia are that no opioids have to be used preoperatively, a longer duration of analgesia postoperatively

and, thereby, a reduced need of opioids postoperatively, and reduced sedation. Type and duration of surgery are also probably very important parameters involved in the problem of nausea and vomiting.

Metoclopramide is the first antiemetic drug of choice at our unit [16] and 13 patients received this drug preoperatively. Only one of these 13 patients experienced nausea indicating a good effect of the drug. No patient was unanticipatedly admitted due to nausea and vomiting during this month of study.

Other drugs used as antiemetics are droperidol or ondansetron. In patients with a severe history of motion sickness, experience of vomiting in connection with anaesthesia and surgical procedures linked with a high incidence of nausea and vomiting, we try the above mentioned drugs [17,18]. During this observation period, none of the drugs were used.

Local anaesthetic drugs for postoperative pain management are increasingly used. Wound infiltration and subfascial infiltration at inguinal hernia repair with local anaesthetics are effective methods for successful postoperative pain relief [19]. A new approach for postoperative pain management for arthoscopy has developed during recent years and made this kind of surgery extremely suitable for one-day surgery. Several studies have reported beneficial effects of intra-articular opioids given alone or in combination with local anaesthetic drugs, pre- and postoperatively [20–22]. A programme for administration of opioids and local anaesthetics postoperatively into the joint is now in progress at our unit.

In most cases, a combination of local anaesthetics/peripherally given opioids and small doses of i.v.-administered opioids and/or NSAID's is the base for postoperative pain management followed by orally-given weak opioids combined with paracetamol.

Quality of care is a most important issue and should be assessed continuously in quality improvement programmes. To collect data about pain management, complications and other objectives concerning quality is an ongoing process and must be an integral part of one-day surgery. It is most important to monitor factors of high importance for patient well-being such as pain, a factor not normally controlled in quality control programmes where economical factors dominate. Our results indicate that the use of a well-structured programme for postoperative care results in low and well-tolerated pain intensity in the majority of patients.

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ELSEVIER

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Patient evaluation of routines in ambulatory hernia surgery

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Abstract

In order to make more effective use of clinical resources, the routines concerning ambulatory hernia surgery were altered in our department. Based on the information from the referring physician, patients not older than 75 years were elected for surgery without pre- or post operative consultations. A questionnaire, rating satisfaction using a five-step analogue scale, was sent to 169 patients (response rate 91%) subjected to ambulatory surgery during 1992–93, of which 76% had been accepted without a preoperative consultation. The mean patient wish for a preoperative consultation was 2.5, largely independent of age and distance to the hospital. Eighty two percent of the patients rated their satisfaction with the operative result to '4' or '5', significantly correlating the satisfaction with the information given. We conclude that, on condition that the communication with the general physician is good, it is possible to admit 75% of the patients to ambulatory surgery without a preoperative consultation. Although our patients received written information, many of them expressed a wish for hospital consultations. In addition, the present results also highlight the importance of adequate patient information in ambulatory surgery.

Keywords: Ambulatory surgery; Inguinal hernia repair; Patient satisfaction; Visual analogous scale

1. Introduction

In the last few decades, cost-effectiveness has become a factor of growing importance in health care planning. To achieve that goal, an increasing part of surgery is performed in ambulatory practice. Since hernia surgery is one of the most common operations in general surgery [1], changes in the outcome of, and routines concerning, this operation will significantly influence health cost. Cost-effectiveness in response to outcome has been analyzed by several authors [2–4]. Furthermore, a number of studies [5–9] have indicated that hernia repair in ambulatory practice is cost-effective, appreciated by the patients, and does not lead to higher recurrence frequencies.

The omission of pre- and postoperative consultations, to further increase cost-effectiveness, is not yet common practice. Few, if any, studies have been published regarding the outcome of, and patient satisfaction with, such simplified routines in the case of ambulatory hernia surgery. This study consists of an evaluation of 169 cases, in which 76% of the patients were operated without pre- or postoperative consultations.

2. Methods

2.1. Routines

Patients aged under 75 years were elected for ambulatory surgery without preoperative consultation, provided that the referring physician clearly stated that the patient suffered from a hernia causing symptoms, and no contraindications were present. The hospital's admittance area is widespread, and 42% of the patients lived at a distance of more than 50 km (10% more than 100 km) from the hospital.

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All patients were offered surgery within 3 months from referral. A letter was sent to the patients 2–3 weeks in advance which included the date of the planned operation and information concerning the operative routines. The day before, patients were contacted by telephone, as a reconfirmation and to inform about the scheduled time of the operation. Before the operation, each patient was examined by the surgeon to confirm the diagnosis. Patients operated in the morning were discharged in the afternoon, while patients operated in the afternoon were offered the option of staying until the following morning. When discharged, the patients were given written information and NSAID analgesics for 3–5 days.

2.2. Evaluation

Patient satisfaction questionnaires were sent by mail to all living patients subjected to ambulatory hernia surgery at Mora Hospital during 1992–93. The 169 patients were aged from 18 to 75 years (mean age 55) and they constituted 52% of the total number of inguinal hernia operations at our hospital that year. A reminding letter with the same content was sent to patients who had not responded within 2–3 weeks.

Patient satisfaction was estimated using a five step analogue or rating scale, where '1' was clearly 'no' and '5' was clearly 'yes', and thus '3' was the middle point of the scale. The questionnaire consisted of 14 questions, of which nine (listed in Table 1) were answered using this scale. Two of the questions were answered by 'yes' or 'no' (wish for ambulatory surgery in case of the need for another operation and possibility to leave hospital as planned). Time of sick-leave was estimated in weeks. Furthermore, age and distance to the hospital were divided into four groups each (<35, 35–50, 50–65, >65 years and 0–30, 31–50, 51–99, >100, km respectively).

Table 1
Mean patient satisfaction ratings of factors asked about on the five step analogous scale

Factor	*Satisfaction rating (mean)*
Wish for preoperative consultation	2.5
Wish for postoperative consultation	2.7
Preoperative information	4.2
Postoperative information	3.8
Peroperative analgesia	4.8
Postoperative analgesia	4.3
Analgetics for use at home	4.2
Healing problems with operative incision	1.7
Operative result	4.4

The rating '1' is clearly 'no' and '5' is clearly 'yes'.

Fig. 1. Distribution of patient satisfaction ratings of wish for a pre- (A) and post- (B) operative consultation, respectively.

Mean values were used to rate the satisfaction or opinion of the patient population. Correlation between variables was estimated using Pearson's test for linear regression (continuous variables).

3. Results

Based upon referral information, 76% of the patients could be accepted for surgery without a preoperative consultation, while the remaining 24% were subjected to a preoperative hospital consultation in order to confirm the diagnosis. In no case was a planned operation cancelled. The immediate response rate to the questionnaire was 78% and another 13% responded after the reminder (total response rate 91%). There was no significant difference regarding age, sex or distance to the hospital between responding and nonresponding patients.

Table 2
Correlation coefficients, coefficients of determination and possibility rates against satisfaction with the operative result (Pearson's linear correlation test for continuous variables)

Factor	$r(X,Y)$	r^2	*Correlation*
Wish for preoperative consultation	0.18	0.03	N.S.
Wish for postoperative consultation	−0.20	0.04	N.S.
Preoperative information	0.34	0.12	$P < 0.001$
Postoperative information	0.52	0.27	$P < 0.001$
Postoperative analgesia	0.20	0.04	N.S.
Analgetics for use at home	0.32	0.1	$P < 0.01$
Healing of operative incision	−0.02	0.00	N.S.
Time of sick listing	−0.06	0.00	N.S.
Age	0.15	0.02	N.S.
Distance to hospital	−0.12	0.01	N.S.
Choose ambulatory surg. another time	−0.04	0.00	N.S.
Possibility to leave hospital as planned	−0.23	0.05	$P < 0.05$

Mean satisfaction ratings of factors asked about in the questionnaire are shown in Table 1. The patient wish for both a pre- and postoperative consultation (Fig. 1) was clearly detectable. There was an inverse correlation between the wish for a preoperative consultation and distance to the hospital ($P < 0.05$), independent of age. Nevertheless, 82% of the patients rated their satisfaction with the operative result at '4' or '5'.

The satisfaction with the operative result was correlated with a number of factors as shown listed in Table 2. The overall satisfaction with the operation was clearly correlated with satisfaction with pre- and postoperative information, whereas most of the other factors listed, among them wound healing, were not significant. Furthermore, the rated satisfaction with the pre-operative information was significantly higher than that of the postoperative information ($P < 0.05$).

4. Discussion

The aim of the present study was to evaluate patient satisfaction with new and simplified routines in ambulatory hernia surgery. The reason for changing routines was to optimize cost-effectiveness in ambulatory surgery and facilitate treatment for patients living in countryside areas who had long travel distances to the hospital.

Recently, the cost-effectiveness in a larger population, including the present patients, has been investigated in response to technical factors of the operation (i.e. type of hernia, operation or technique used) and recurrence frequency [2]. Cost effectiveness in hernia surgery has also been discussed in regard to the surgeon's degree of specialization [10]. The present study indicates a new way to make hernia surgery more cost-effective.

Patient ratings with five-point scales have been proven useful in the evaluation of patient satisfaction in outpatient practice and health plans [11], and for comparing the quality of patient-physician contact among residents [12]. The present scale was modified in that the earlier used EVGFP (excellent, very good, good, fair, poor) scale was replaced by a five-degree analogue one. However, the number of ratings in this study is, according to the earlier investigations, large enough for giving a good measure of patient satisfaction [11].

Furthermore, the present response frequency is comparable to earlier questionnaire investigations of operated Swedish inguinal hernia patients [13].

Satisfaction with the operative result correlated strongly with satisfaction with the information given but not to wound healing or to a wish for ambulatory surgery in case of another operation. This suggests the possibility of increasing the patients satisfaction by optimizing pre- and postoperative information. It is also possible, although not evaluated here, that the importance of information is greater with the simplified routines used in this study. Many of the patients expressed a wish for pre- and postoperative consultation at the hospital, which was largely independent of age and distance to the hospital. However, as shown in Table 2, this did not correlate with their satisfaction with the operative result and might, therefore, be of fairly low importance for the quality of the overall experience.

Furthermore, the provision of analgesics for use at home has been pointed out as a crucial factor for satisfaction in ambulatory surgery, but was uncorrelated with satisfaction with the new routines described here.

In conclusion, it is possible to increase cost-effectiveness in ambulatory hernia surgery by decreasing the number of pre- and postoperative hospital consultations, without detectable effects on the overall satisfaction with the operative result. Thus, three-fourths of the patients can be accepted directly to ambulatory surgery, provided there is a well-functioning cooperation with the referring physician. Furthermore, patient information is pointed out as an important part of the quality assessment in ambulatory practice.

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Ambulatory Surgery

Bed cost savings in day surgery in Australia

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Abstract

Sophisticated high quality day (ambulatory) surgery, in purpose constructed centres together with hospital based units, has been steadily progressing over the past 25 years, especially the last 10 years, but more so in some countries than in others. One of the many claimed advantages of day surgery is the bed cost saving where more major procedures are carried out in day surgery rather than overnight stay surgery in acute bed hospitals. In 1994–95, the National Day Surgery Committee of Australia carried out a study to estimate, with acceptable accuracy, the number of bed days which would be saved if a group of commonly carried out operative procedures were carried out in day surgery rather than overnight stay surgery. It was determined to express these savings as bed days rather than dollar value, however the dollar-cost saving is easily calculated by applying the known bed-day cost for a given hospital. It is shown that, for the 18 operative procedures included in the study, many thousands of bed days (and therefore many millions of dollars) can be saved by treating these patients in day surgery rather than overnight surgery.

Keywords: Ambulatory surgery; Bed days/cost savings

1. Background

The National Day Surgery Committee of Australia was formalised in 1985 to address standards of day surgery. In 1988, its scope was extended to advise on measures that would encourage the success of quality day surgery. The preparation of this paper is a continuation of this role to demonstrate the possible savings which may be achieved by a determined strategy to encourage a change in designated procedures from overnight to day-only surgery.

The growth figures for day-only surgery, in Australia, have been slower than anticipated and are indicated in Table 1 [1].

These data are Australian National Data collected for privately-insured patients in public and private hospitals, and included medical as well as surgical patients.

Table 1
Incidence of day surgery in Australia

1989/1990	27.10%
1990/1991	31.60%
1991/1992	33.20%
1992/1993	35.50%

Other sources and Medibank Private [2] (the largest private hospital insurance organisation in Australia) claims experience reflects a similar percentage trend in surgical patients; however, compared with international trends there is still considerable scope for increase.

Available information suggests that part of the increase in claims related to day-only surgery has been due to a movement of patients previously treated in casualty, out patients, diagnostic units or doctors' surgeries into day-only facilities.

2. Outline

This paper identifies potential savings within the health care industry if a designated percentage of selected procedures, as recommended by the National Day surgery Committee's 'Incentives for the Expansion of Day Surgery', March 1992, (Table 2) were to shift to day-only surgery. Examination of the claims figures of Medibank Private can be reasonably expected to provide a snapshot of the trends in health insurance claiming patterns.

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Table 2
Selected procedures for transfer to day surgery

Description	*% Day only*	*% Overnight*
Breast: Excision of cyst or fibroadenoma or other local lesion	37.2	62.8
Breast: Excision of cysst, fibroadenoma or other local lesion where frozen section is performed	38.6	61.3
Femoral or inguinal hernia, or infantile hydrocoele repair of	13.2	86.7
Umbilical, epigastric or linea alba hernia repair of... <10 years of age	44.9	55.1
Pilonidal sinus or cyst or sacral sinus or cyst excision... <10 years of age	10.7	89.3
Varicose veins, multiple ligation... one leg	30.7	69.3
Varicose veins high ligation and complete stripping... one leg	5.6	94.4
Cystoscopy with urethroscopy... not associated with any other urological endoscopic procedure	47.2	52.8
Cystoscopy with ureteric catheterisation	43.8	56.2
Cystoscopy with one or more of ureteric dilation, insertion or ureteric stent, biopsy	29	71
Cystoscopy with ureteric catheterisation, unilateral or bilateral	38.2	6.2
Cystoscopy, with biopsy of bladder	44.6	55.4
Hysteroscopy with dilation of cervix under GA	48.9	51.1
Hysteroscopy with endoetrial biopsy or suction curettage or both	61.4	38.6
Hysterscopy with uterine adhesiolysis or polpectomy or tubal cathererisation or R/O IUD	66.3	33.7
Lens extraction and artificial insertion	30.5	69.5
Squint operation for one or both eyes involving one or two muscles	37.8	62.2
Lop ear, bat ear or similar deformity correction of	27.3	72.7

The results are extrapolated to provide an estimate of the national savings in bed days to the private health insurance funds using the premise that Medibank Private covers approximately 25% of the insured population. These results can be further extrapolated to estimate the national savings of both the public and private hospitals of bed days based on the premise that approximately 38% of the population have private health insurance.

3. Methodology

A statistical report was produced from the Medibank Private data base detailing the number of patients and the day-only accommodation band (related to length of time in theatre and type of anaesthetic) for the calendar year 1993. These were aggregated national figures. A second statistical report was produced from Medibank Private claims data detailing the average length of stay of all patients in private hospitals in all States. The claims experience related to the list of procedures, recommended by the National Day Surgery Committee as those which might be more appropriately undertaken on a day-only basis, was reviewed using data from both these reports. The review included a comparison of the number of these procedures undertaken on a day-only basis and those undertaken on an overnight basis with the average length of stay of overnight patients included in the analysis.

It was found that 80% of those undertaken on a day-only basis occurred as Day Only Band 3 (procedures requiring general anaesthetic of less than 1-h duration) and the benefit used in the calculation of savings was a weighted average of the Band 3 benefit in all States (Australia has seven States with a total population of approximately 18 million people). The figures used to calculate the overnight bed rate was a weighted average of the general surgical shared (private) ward rate and where applicable the 'Medical Other' rate from the highest hospital benefit table in all States. The figure was weighted to take into account the different number of claims and the different amount of benefit paid in each State (Table 2).

4. Notes to data

Data have been extracted on a national basis from Medibank Private claims history for services in private hospitals and day-only facilities.

Identified savings relate to accommodation benefits only and assume that the procedure benefit for the services is the same whether performed as an overnight or day-only patient. Benefits used to calculate possible savings were the top hospital brochure benefits in each State and the applicable day-only Band accommodation benefit calculated from a weighted average of the relevant benefits in each State.

To protect the commercial sensitivity of using benefit calculations from only one fund no dollar amounts have been quoted.

5. Findings

From the figures available, the percentage of bed days for designated procedures undertaken on a day-only basis in the period under review is indicated in Table 2. The procedures where the greatest savings in

dollar amounts could be achieved in order of ranking are:

Lens extraction and artificial lens insertion.

Varicose veins, high ligation and complete stripping — one leg.

Cystoscopy with urethroscopy — not associated with other urological endoscopic procedure.

Breast: excision of cyst, fibroadenoma or other local lesion where frozen section is performed.

Pilonidal sinus or cyst, or sacral sinus or cyst, excision — over 10 years of age.

Breast: excision of cyst or fibroadenoma or other lesion.

The number of overnight bed days which could be saved over all the designated procedures if 80% of cases were undertaken on a day-only basis is calculated to be approximately 22 129 overnight bed days per annum, and if 60% of cases were undertaken on a day-only basis, the amount is calculated to be approximately 12 881 overnight bed days per annum on 1993 figures.

The increase in day-only bed days at the lesser cost and benefit rate is 12 253 bed days if 80% of these cases were to be undertaken on a day-only basis and 6602 if the number was 60%.

The overall calculated savings in bed days is 9876 at 80% rate and 6297 at the 60% rate.

6. Conclusion

The costing of the two options achieving an increase to 60% or 80% of these procedures on a day-only basis suggests significant annual savings in expensive bed days.

Using the premise that Medibank Private covers 25% of the insured population, these figures can be extrapolated to predict savings of approximately 40 000 bed days each year throughout the private health care sector. (Private hospital bed days per annum 5 176 000).

If these savings are considered in respect to the public health care system, using the premise that only 38% of the population is covered by private health insurance thus 62% of the population rely principally on the public sector, with minimal being self insured, the savings in the public sector in bed day costs would be expected to be in the order of 65 000 bed days nationally (public bed days per annum 15 587 000).

This is a simplistic view based only on direct calculation on the figures and does not take into account the many other factors which could affect the possible savings. However, the figures suggest significant savings in hospital costs if strategies can be developed to encourage any movement from overnight to day-only surgery.

Any reference to specific dollar values has been purposely omitted on the grounds that predicting specific dollar savings frequently results in unrealistic expectations and can give rise to inappropriate re-allocation of dollar amounts which may result in insufficient funds being initially allocated in the budgetary process to hospital accommodation. It can be seen that the savings in bed days demonstrates savings in the total health care industry of millions of dollars in a twelve-month period if the suggested targets can be reached.

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Ambulatory Surgery

Recovery after day surgery with intravenous anaesthetic agents

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1. Introduction

In 1847 John Snow in his work *On the Inhalation of the Vapour of Ether* recognised that elderly patients recovered more slowly than younger patients. He also documented that post-operative nausea and vomiting (PONV) and respiratory depression were important recovery complications. In addition he also noted a period during recovery when the 'mind wanders'. A century ago mortality was the major concern following general anaesthesia whilst anaesthetists in day surgery units now expect a good quality, swift recovery with pain well controlled and a low incidence of PONV. The aim of this article will be to define what recovery really is and to determine the methods used to assess it. Only then will it be pertinent to examine which intravenous anaesthetic agent either for induction or maintenance, will produce the best possible recovery profile. The qualities of the ideal intravenous anaesthetic agent are outlined in Table 1.

Table 1
Properties of an ideal intravenous anaesthetic agent

1.	Rapid onset (requires high lipid solubility and un-ionised at blood pH to allow penetration of blood-brain barrier)
2.	Rapid recovery (rapid redistribution and metabolism with no accumulation)
3.	Analgesia at sub anaesthetic concentrations
4.	Minimal cardiovascular and respiratory depression
5.	No emetic effects
6.	No excitatory phenomena (e.g. coughing, hiccough, involuntary movements) on induction
7.	No emergence phenomena (e.g. nightmares)
8.	No epileptiform activity
9.	No interaction with neuromuscular blocking drugs
10.	No pain on injection, venous sequelae and safe if injected inadvertently into an artery
11.	No toxic effects on other organs with no stimulation of porphyria
12.	No hypersensitivity reactions or release of histamine
13.	Water-soluble formulation with long shelf-life

2. The definition and importance of recovery

2.1. Recovery phases

Recovery may be conveniently divided into three phases and all anaesthetists should appreciate these phases as many relevant publications discussing recovery refer to these time intervals.

Phase 1 Immediate recovery may be defined as the return of consciousness and protective reflexes following general anaesthesia.

Phase 2 Intermediate recovery lasts for up to 2–3 h and most day units will continue to nurse these patients within their wards. There is a need for patients to return to street fitness before being discharged from day units.

Phase 3 Late or full recovery defines the phase when all the effects of general anaesthesia have disappeared. Usually this relates to a 24-h period after anaesthesia.

The importance of a early recovery lies in the achievement of airway control and protection although a shorter stay in the recovery room may have important cost saving implications, i.e. the longer the recovery the more nursing time has to be resourced. The intermediate period of recovery on the ward has been thoroughly investigated to determine differences between anaesthetic agents and at this time complications such as PONV may occur. Both PONV or a delayed return to street fitness on the ward account for approximately 20% of hospital admissions from a dedicated day unit

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Table 2
Common recovery tests in anaesthetic practice

1. Clinical Tests	(a) Orientation
	(b) Sitting unaided
	(c) Walking in a straight line
	(d) Romberg's test
	(e) Picking up matches
	(f) Countdown test
	(g) Memory function
2. Paper and pencil tests	(a) Deletion of 'P's
	(b) Triegers' test
3. Psychomotor tests	(a) Maddox wing test
	(b) Flicker fusion test
	(c) Pegboard test
	(d) Post box test
	(e) Reaction timing
	(f) Simulated driving
	(g) EEG recordings
	(h) Critical flicker fusion test

[1]. These admissions will have obvious cost implications and may even defeat the cost effectiveness of day surgery. Furthermore a rapid and good quality late phase of recovery will be important to reduce the loss of earnings for day patients. Perhaps of even greater importance is the reduction of the risk of motor vehicle accidents, home accidents and the avoidance of costly litigation.

2.2. Quantitative measurement of recovery

Recovery may be assessed in three ways and examples of common recovery tests are outlined in Table 2.

A major problem when comparing the recovery characteristics of agents is that to determine any differences between anaesthetic agents becomes more difficult with time, thus more complex tests may be required to show these recovery variations. Problems of patient boredom and loss of compliance will then appear with more complex and accurate tests. No single test has been identified which provides reliable recovery information for all aspects of psychomotor functions following general anaesthesia.

Table 3
Discharge criteria — Addenbrooke's Day Surgery Unit 1995

1.	Stable vital signs
2.	Alert and oriented
3.	Tolerating oral fluids
4.	Able to sit unaided
5.	Pain controlled, wound checked
6.	Written and verbal discharge instructions
7.	Medication to take home and mobility aids provided
8.	Responsible adult escort with patient

Table 4
Approximate elimination half-lives of the agents

Agent	Half-life (h)
Thiopentone	11.5
Propofol	3–4.8
Methohexitone	4
Etomidate	1.25

The criteria for patient discharge from the Addenbrooke's day surgery unit are outlined in Table 3. Although this duty may be delegated to the nursing staff the responsibility still lies with the anaesthetist involved with these day cases.

3. Agents influencing recovery

It is now appropriate to consider the various intravenous agents used in day surgery which may influence recovery. This consists of two sections, the first being the effect of different induction agents on recovery and secondly the differences between maintenance with intravenous agents compared with themselves and also their volatile inhalation anaesthetic counterparts. Additional factors which may potentially delay day case recovery times include sedative premedication and prophylactic pre-emptive analgesic regimes.

3.1. Intravenous induction agents

Propofol is the most popular day case anaesthetic induction agent although thiopentone, methohexitone and etomidate do have their advocates. So far there have been few studies comparing recovery of these agents with ketamine in a day case setting. Table 4 shows the half-lives of these agents. It may be tempting to draw Firm conclusions about their recovery performance from this table but much of their activity is related to redistribution and not metabolism thus making meaningful comparison difficult.

Indeed propofol has been compared to other induction agents for short procedures and there is evidence which records no alteration in post-operative co-ordination [2]. One study has reported that discharge time was independent of which ever induction agent was used, including thiopentone [3]. However evidence shows that psychomotor impairment exists for up to 5 h with thiopentone as compared to 1 h following propofol [4,5]. Again there have been claims of a significant difference in sitting up and street fitness times together with a reduced incidence of PONV in a propofol group [6]. Propofol compares favourably with methohexitone producing a faster recovery of psychomotor performance although again after 4 h there was

no difference recorded between thiopentone, methohexitone or propofol [7]. Other work has noted that propofol patients have a better sense of well-being compared to other intravenous agents but whether this is attributable directly to the agent itself or to lack of PONV or barbiturate 'hangover' remains unclear [8].

When propofol was compared to thiopentone in children it was found that in children less than 5 years old only the time to spontaneous eye opening was shorter after propofol. However in children aged 5–11 years old, times for spontaneous eye opening, giving name and discharge were shorter after propofol induction. These results indicate that propofol hastened early recovery in children undergoing day case surgery, but earlier discharge occurred only in older children [9].

3.2. Intravenous anaesthetic agents for maintenance

On examination of recovery following intravenous agents when used for of anaesthesia or sedation several studies have looked at these agents in comparison with each other but perhaps the most interesting debate arises when the recovery aspects of intravenous anaesthetic agents are compared with their volatile counterparts. During sedation when propofol, methohexitone and midazolam were compared it was discovered that the vigilance and concentration of the subjects were worse in the midazolam and methohexitone groups [10]. There is also evidence that premedication with midazolam prior to sedation with propofol may even increase anxiolysis and sedation without affecting discharge from the recovery room [11]. Indeed the use of midazolam premedication prior to general anaesthesia does not appear to alter the patients ability to reach street fitness times in the day surgery context [12].

When propofol and thiopentone were compared as maintenance agents for brief surgical procedures the recovery in memory and psychomotor performance was notably superior in the propofol group. The subjective feelings of tiredness, drowsiness and alertness were all worse in the thiopentone group even at 24 h [13]. This is not surprising given the different pharmacology of the agents and the potential for accumulation with thiopentone.

Again methohexitone and etomidate have been studied, together with althesin, in the short surgery setting and it was found that recovery from methohexitone appeared the fastest. It was interesting to note that in this study it was found to be too difficult to produce good operating conditions with etomidate alone and the etomidate group recorded the highest complication rate [14].

When propofol and methohexitone were compared in outpatient anaesthesia propofol was associated with fewer side effects e.g. hiccough, PONV and the phase 1 and 2 recovery times for awakening and ambulation were shorter in the propofol group [15].

The common theme throughout these studies comparing the intravenous agents against themselves for maintenance in day case surgery is not the question of recovery. It would appears that propofol has a superior recovery profile as shown by psychomotor testing but often discharge times are similar. Perhaps of greater importance is that the quality of recovery appears better in the propofol groups and the incidence of peri-operative side-effects and complications is lower when propofol is used. Therefore, quality day case anaesthesia is probably more important than recovery.

3.3. Recovery aspects of total intravenous anaesthesia (TWA) compared to volatile anaesthetic maintenance

TIVA has become popular in many day surgery units and the use of propofol for maintenance should be compared with the older and newer generation of volatile inhalational anaesthetic agents. When propofol TIVA was compared to an anaesthetic comprising thiopentone or halothane induction together with halothane maintenance m children, the TIVA group was the slowest to recover with no difference in recovery even if thiopentone was used for induction instead of halothane [16]. Again TIVA recovery has been compared with an enflurane anaesthetic and the immediate recovery was shorter in the propofol group. There would appear to be an increase in well-being again recorded in the TIVA groups but the time to reach discharge criteria was the same in both groups in one study [17], but significantly shorter in the propofol group in another publication [18]. Finally, both studies showed there was an increased incidence of PONV in the enflurane group.

When propofol TIVA was compared with isoflurane maintenance conflicting results arose showing minor differences in psychomotor test results but overall propofol provided a faster recovery [19–22]. Again a higher incidence of PONV was noted in the isoflurane groups. If isoflurane was used to supplement TIVA immediate recovery was slowed and the incidence of PONV was higher although discharge times remained the same [23]. If propofol is used to finish major cases using isoflurane immediate recovery was faster but the incidence of PONV was still higher than TIVA alone [24]. In a direct comparison between TIVA and isoflurane in major cases extubation times were longer in the TIVA groups but recovery appeared to be similar [25].

The newer agent sevoflurane may offer smooth inhalational induction characteristics with a 30% faster immediate recovery compared to propofol. However the incidence of PONV was high but in the intermediate phase of recovery awareness, confusion and co-ordination were similar [26]. Desflurane is known to produce a high incidence of airway complications if

used for an inhalational induction but it may offer rapid recovery even after long surgery and minimal metabolism. Desflurane recovery was again faster than propofol in the early phase of recovery but by 2 h psychomotor test times were equal. Although the street fitness times were similar the desflurane group recorded a 50% incidence of PONV against the 12% of the propofol patients [27–30].

Finally one group investigated TIVA alone and recorded the reasons for prolonged first phase recovery. A total of 14 882 patients was studied and prolonged awakening, defined as greater than 15 min from the end of general anaesthesia, occurred in 6.8% of cases. The mean wake up time was 7.2 min and the factors associated with this were males, endotracheal intubation, age > 65, abdominal surgery, infusion > bolus, addition of isoflurane and a total dose of propofol > 8 mg/kg [31].

4. Conclusions

Total intravenous anaesthesia (TIVA) with propofol and alfentanil or fentanyl has its advocates for day case anaesthesia in Britain. At the Addenbrooke's demonstration day unit approximately 35% of anaesthetics are TIVA [32] but newer volatile agents have now entered the market with rapid recovery profiles.

Recovery will depend on your definition and care should be taken to describe which phase of recovery is being tested and by which recovery tests. The duration and type of surgery will influence anaesthetic recovery as will the expertise of the anaesthetist with whatever agent is used.

As regards the intravenous agents in day surgery it is the quality of recovery which is important in addition to the incidence of peri-operative complications. Etomidate produces PONV and is difficult to use intra-operatively with methohexitone having a high incidence of airway complications. Thiopentone gives similar discharge times to propofol but hangover effects still remain. Therefore, for induction it would appear that propofol has a good recovery profile and the suppression of laryngeal reflexes assists the introduction of the Brain laryngeal mask airway.

Which agent should be used for the maintenance of anaesthesia? The debate is still open and although desflurane produces the most consistent early recovery there is little evidence to support large significant variations in the speed to street fitness with any particular technique. Indeed there is a remarkable similarity with many recovery tests at 60–120 min following the cessation of general anaesthesia. However, there is little doubt that PONV is associated with volatile anaesthesia and so in this respect propofol TIVA will always produce a rapid good quality recovery.

Recent evidence in the costing of day case anaesthesia has proven that propofol was indeed more expensive than volatile agents [33]. However, this finding will have to be offset by the expense of day case hospital admission especially with moderate to severe PONV after volatile anaesthesia. Basically there is no single anaesthetic agent which will produce the overwhelmingly best recovery profile and for day surgery the individual anaesthetist should make his or her own choice. However the authors believe that even the most recently introduced inhalational agents will find it hard to compete with TIVA in the form of propofol and alfentanil for day case surgery.

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Ambulatory Surgery

The efficacy and safety of postoperative pain management with tramadol for day case surgery

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Abstract

The efficacy and safety of the centrally acting analgesic, tramadol hydrochloride (Zydol), was investigated in 20 day case patients undergoing removal of impacted third molar teeth under intravenous sedation and local anaesthesia. A single 100-mg dose of tramadol was administered intravenously just prior to induction of sedation with midazolam. Tramadol was well tolerated and provided good postoperative analgesia. There was no evidence of respiratory depression and tramadol did not have any sedative effect. It is suggested that tramadol is a useful addition to the analgesic armamentarium for use in out-patient and day-case oral surgery.

Keywords: Analgesia postoperative; Tramadol; Oral surgery; Day case surgery

1. Introduction

Although many variants of opioids and non-steroidal anti-inflammatory drugs (NSAIDs) have been introduced in pain management, there are still challenging problems in clinical practice [1]. Whilst morphine may remain the gold standard for the treatment of severe acute pain in in-patients, it is not suitable for out-patients and day-case surgery postoperative pain control. Respiratory depression can be a serious complication of opioid use and the problems of tolerance, addiction and abuse are well known [2]. Weak opioids like codeine have proven to be pro-drugs of morphine-like metabolites and to be flawed by problems of those similar to morphine [3]. The NSAIDs remain first-line therapy for dental postoperative pain which is largely inflammatory in origin but have problems of gastric toxicity and bronchospasm [4–7] and have limited use in the control of severe rather than mild or moderate pain [1,8].

Tramadol is described as a centrally acting analgesic that has demonstrated that it is possible to differentiate between effective analgesia and severe opioid-typical side effects, that moderate to severe pain can be relieved without respiratory depression, constipation, euphoria and with a greatly minimised abuse and dependency potential [9]. The analgesic properties of tramadol are not completely explained by action via opioid receptors, as in some pain models its antinociceptive effect is only partially antagonised by naloxone. A second mechanism of action has been described which results in inhibition of the descending monoaminergic systems [10–12]. The dual mode of action is claimed to result in a synergistic potentiation of analgesia by the component effects and weakly expressed side-effects. The presence and relevance of this mode of action in humans is supported by the findings of Dayer et al. [12] and Sunshine [13]. The objective of the study was to assess the efficacy and safety of intravenous (i.v.) tramadol hydrochloride (Zydol) in

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patients undergoing surgical removal of an impacted third molar tooth under local anaesthesia and intravenous (i.v.) sedation. The study was double-blind, randomised and placebo-controlled.

2. Methods

Twenty patients who required removal of an impacted lower third molar, with bone removal and tooth division, and who might also have required extraction of an upper ipsilateral third molar were entered into the study. Patients were to be aged 18–45 years, weigh between 50 and 100 kg and be in general good health. The main exclusion criteria were: pregnancy or lactation; history of epilepsy or other clinically-significant co-existing disease; history of alcohol, narcotic or other drug abuse; recent or concomitant use of MAO inhibitors or other medication likely to interfere with the study drug or its assessment and a history of hypersensitivity to opioid drugs. All patients entering the study gave written informed consent prior to its commencement and ethics committee approval of the protocol was obtained.

The study was blinded by means of a saline placebo solution with identical packaging to the tramadol and only the patient's number as an identifier. Whether the medication assigned to a given patient number was active or placebo was determined according to a computer-generated randomisation code. Patients were assigned their study numbers sequentially as they entered the study. The tramadol intravenous solution was supplied as 100 mg/ml in clear ampoules. All treatments were carried out by the same operator and all assessments by a single research nurse.

The patient was placed in the supine position and the tramadol or placebo administered by slow (100 mg over 2 min) bolus injection via an indwelling cannula in the dorsum of the hand. This was immediately followed by induction of sedation with the 2 mg/ml preparation of intravenous midazolam (Hypnovel). The latter was titrated slowly, via the same cannula, to the desired sedation end point, but not exceeding 10 mg. Local anaesthesia was induced with prilocaine 4% solution without vasoconstrictor and therefore shorter acting. The time at which the study medication was administered, the dose of midazolam administered and the times at which surgery started and ended were recorded. At tooth division the intraoperative pain was assessed by the patient according to the verbal rating scale (VRS): none, mild, moderate or severe.

Immediately after the completion of surgery, the first postoperative pain assessment was made as a baseline measure. The pain assessments were made by means of a 100-mm visual analogue scale (VAS) and a verbal rating scale (VRS). The VAS was marked at one end 'I have no pain' and at the other, 'The worst pain imaginable'. The VRS was presented as none, mild, moderate and severe. Further assessments were made every 15 min until 2 h after baseline and then at 2 h 30 min and finally at 3 h after baseline. Postoperative analgesia, if required, was ibuprofen, 200 mg tablets, the dosage being 400 mg. The time at which any patient requested and took the escape analgesia was recorded.

Shortly before the patient was discharged from hospital, the patient and the investigator made global assessments of the study therapy. Global assessments of the efficacy and tolerability of the medication, and the quality of the sedation, were made by means of the VRS: poor, satisfactory or excellent.

Safety was evaluated by continuous recording by automatic sphygmomanometer and pulse oximeter of blood pressure, pulse rate and arterial oxygen saturation. Any clinically significant deviations in any of these parameters was recorded as an adverse event. Patients were asked for symptomatic complaints using indirect questioning at each assessment. A phrase such as 'Is anything other than the surgery pain bothering you?' was used. All symptoms were recorded as adverse events, whether or not deemed to be causally associated with the study medication. The time of discharge was recorded and the reason for any delay in discharging the patient was noted. At follow-up, 15 days after surgery, the patient was questioned about any adverse events which may have occurred since the end of the study. At this time the patient also made a final global assessment of the study therapy.

3. Results

All 20 patients who were recruited into the study were included in both the efficacy and safety analyses. Ten patients were randomised to receive tramadol and 10 to receive placebo. Statistical analysis was performed using SPSS (production release for Windows). All significance tests were two-tailed and carried out at the 5% level. All summaries of data were by treatment group.

Demographic details are shown in Table 1. Mean midazolam doses were 7.7 mg and 6.8 mg in the tramadol and placebo groups, respectively. Taking

Table 1
Demographic details of study patients

	Tramadol	Placebo	Overall
Number of patients	10	10	20
Male	4 (40%)	4 (40%)	8 (40%)
Female	6 (60%)	6 (60%)	12 (60%)
Mean age (years)	24	27	25.5
Mean weight (kg)	72.4	66.1	69.3

Table 2
The areas under the visual analogue (VAS) curves assessing 3 hof postoperative pain

	Tramadol	Placebo
Number of patients	10	10
Using analysis as if rescue medication was not taken[a]		
Median	0.9	7.9
Range	0.0–27.0	0.3–33.2
Using substitution for missing data and for data recorded after first use of escape analgesia[a]		
Median	2.1	13.4
Range	0.0–36.4	0.2–61.2

[a]Treatment comparison, byWilcoxon Rank Sum Test, <IT>P</IT> = 0.005

body weight into account, the mean dose of midazolam was 0.11 mg/kg for both groups. All patients received 4.4 ml of prilocaine for the removal of the lower third molar and 2.2 ml for the extraction of the upper if this was carried out. The mean duration of surgery was 14.4 min in the tramadol group and 12.5 min in the placebo group. The overall duration ranged from 9 to 22 min.

3.1. Efficacy

3.1.1. Intraoperative pain severity

Six patients in the tramadol group reported no intraoperative pain. Of the four who did report pain, all patients reported it as mild. These figures were the same for the placebo group.

3.1.2. Postoperative VAS pain scores

The primary efficacy variable is the area under the curve (AUC) of the postoperative pain assessments measured using a VAS. AUCs are summarised by presenting the median and range for each treatment in Table 2. The study protocol stated that pain assessments need not be continued after a patient had taken postoperative analgesia. However, patients who did take postoperative analgesia carried on with the assessments of pain until 3 h after the baseline assessment. In order to accommodate these additional data, the AUCs were calculated in two different ways. In the first method assessments made after a patient had taken postoperative analgesia were analysed as if the analgesia had not been taken. In the second method, assessments made after a patient had taken postoperative analgesia were assumed to be missing, and all missing assessments were substituted using the last observation carried forward (LOCF) method. Using the first method, the median standardised AUC was 0.9 in the tramadol group compared with 7.9 in the placebo group. The smaller values indicate less overall pain. The difference between treatment groups tested using the Wilcox Rank Sum test achieved statistical significance ($P = 0.005$). Using substitution for missing data and data recorded after the first use of postoperative analgesia, the median standardised AUCs were 2.1 and 13.4 in the tramadol and placebo groups, respectively. Again the treatment difference was statistically significant ($P = 0.005$).

3.1.3. Postoperative VRS scores

Of patients in the tramadol group, 50% reported no pain and 50% reported mild or moderate pain. No patient reported severe pain. In the placebo group 10% of patients reported no pain and 80% reported mild or moderate pain. Of all patients, 10% reported severe pain. The treatment difference was statistically significant ($P = 0.005$).

3.1.4. Time to first postoperative analgesia

The number of patients who had taken escape analgesia by each postoperative pain assessment is illustrated in Fig. 1. Of the patients in the tramadol group, 20% had taken postoperative analgesia up to 1 h 45 min from baseline, compared with 50% in the placebo group. All patients took ibuprofen only. The mean time to escape analgesia was 119 min for the tramadol group and 89 min for the placebo group.

3.1.5. Time to hospital discharge

The mean time to hospital discharge was 204.2 min and 205.9 min for the tramadol and placebo groups, respectively.

3.1.6. Global assessment of intraoperative analgesia

In both treatment groups the investigators assessment was 'satisfactory' or 'excellent' for almost all patients, and 90% of the patients' assessments at discharge and follow-up were rated 'satisfactory' or 'excellent'. There was no statistically significant difference between groups.

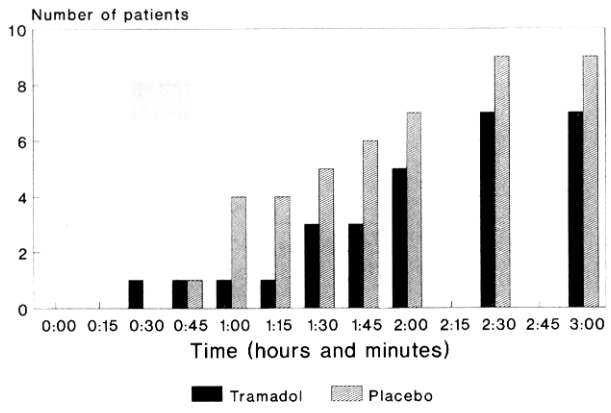

Fig. 1. Number of patients who had taken escape analgesiaby each postoperative pain assessment.

3.1.7. Global assessment of intraoperative sedation

The assessment by the investigator at discharge, and assessments by the patient at both discharge and follow-up were 'excellent' for almost all patients, and showed no statistically significant difference between treatment groups.

3.1.8. Global assessment of postoperative analgesia

At hospital discharge the investigator rated postoperative analgesia as excellent in 90% of the tramadol group compared with 40% of the placebo group. The treatment difference was statistically significant. At hospital discharge 70% of patients in the tramadol group rated postoperative analgesia as excellent compared with 50% in the placebo group. At follow-up 90% of tramadol patients and 40% of placebo patients gave a rating of excellent.

3.2. Safety: adverse events

There were no clinically significant changes in pulse rate, blood pressure or arterial oxygen saturation in any patient during the study. At follow up, one patient receiving tramadol reported postoperative nausea.

4. Discussion

The two treatment groups were very similar. Approximately 60% of all patients were female, with no co-existing diseases. Surgery details for the two treatment groups were also similar. All patients received an identical dose of prilocaine and the mean dose of midazolam in the two treatment groups was similar (tramadol 7.7 mg, placebo 6.8 mg). The duration of surgery was slightly longer in the tramadol group compared to the placebo group (mean 14.4 min compared to 12.5 min). There was no statistically significant difference in the patients' intraoperative pain.

4.1. Efficacy

There were clear treatment differences between the groups regarding postoperative pain assessed by the VASs or VRSs. The VAS assessments yielded median AUC values of 2.1 in the tramadol group compared to 13.4 in the placebo group, and this difference was statistically significant. The VRS assessment of postoperative pain also favoured tramadol. Fewer tramadol patients than placebo patients reported any pain (50% compared to 90%). Again this treatment difference was statistically significant ($P = 0.005$).

The global assessments of post-operative analgesia also favoured tramadol, but the difference in time to escape analgesia between the tramadol and placebo groups was not statistically significant.

4.2. Safety

There were no adverse events during the 3-h period of the study in either the tramadol or the placebo group and there was no evidence of respiratory depression in the tramadol group as measured by arterial oxygen saturation. The doses of midazolam administered were similar in both groups indicating that tramadol did not have any sedative effect. One patient indicated a period of nausea without vomiting, lasting several hours, later in the day of the study.

5. Conclusions

Administration of a single, preoperative, 100-mg dose of i.v. tramadol significantly reduces the postoperative pain experienced by patients undergoing removal of impacted third molar teeth under local anaesthesia and intravenous sedation, as assessed by visual analogue and verbal rating scales. Intravenous tramadol was very well tolerated by the study population and was found to be safe to use in combination with midazolam i.v. sedation for day-case patients.

It is suggested that tramadol is a useful addition to the analgesic armamentarium [14].

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ELSEVIER

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Day surgery for lumbar microdiskectomy: experience with 60 cases

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Abstract

Lumbar microdiskectomies can be performed in an Ambulatory Surgery Center (ASC) with minimal morbidity and patients can be discharged from the recovery room in 2–4 h. This alternative to inpatient surgery has received wide patient acceptance, and is attractive from a cost savings standpoint. In the author's series of 60 'lumbar microdiskectomies' performed in the last 12 months in an ASC, the average post-operative length of stay (LOS) was 198 min.

Keywords: Lumbar microdiskectomy; Outpatient lumbar microdiskectomy

1. Introduction

Lumbar disk disease is a common problem seen on a daily basis by the majority of neurosurgeons in practice. 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 micro-surgery generally have disk herniations causing medically refractory radicular pain and/or objective evidence of radiculopathy. These candidates must be free of psychological or medical contraindications. The 'ideal' patient for outpatient microsurgery has failed all forms of appropriate conservative therapy, has a single level unilateral disk herniation, no significant medical or psychological risk factors and no history of prior lumbar surgery at the presently affected level. After operating on 25 'ideal' patients without any peri-operative problems, the definition of 'ideal' was extended to include patients with bilateral disk herniation, two level disk herniations and recurrent disk herniations. The patients are all counseled pre-operatively in a standard fashion regarding the risks, benefits and alternatives of 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, lumbar microdiskectomies are performed in a hospital operating room with the inpatient hospital course lasting 1–5 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 ASC. By selecting 'ideal' patients for the outpatient surgical environment [1,4] (M. Vise, pers. commun.), coupled with meticulous micro-neurosurgical technique and a specific anesthetic regimen for ambulatory surgery, 60 patients have been successfully operated in an ASC. The average post-operative time in the recovery room prior to discharge home has been 3 h and 18 min. The average cost per patient is 32% lower than area hospitals, including anesthesia services. Patient satisfaction with the entire outpatient lumbar microdiskectomy experience has been extraordinarily high, and the surgical outcomes thus far are equal to that which is considered standard for inpatient lumbar microdiskectomy.

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2. Materials and methods

Between August 1994 and December 1995, the author performed 60 consecutive outpatient lumbar microdiskectomies on 40 males and 20 females at a free-standing outpatient surgery center. 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 maintenence with enflurane/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. The knee-chest position on the Andrews frame was utilized. The correct level(s) for the incision was then localized with needle placement and lateral lumbo-sacral spine X-ray. Following localization, 0.25% marcaine with 1:100 000 epinephrine was injected for local anesthesia.

A midline incision was made, usually 2 cm in length for a single level disk herniation in a non-obese patient, and longer as necessary for two level disk surgery or obese patients. The Bovie cutting current was used to incise the lumbar fascia in the midline, then the paraspinal muscles were stripped subperiosteally with Langenbeck periosteal elevators on the side of the disk herniation(s). A self-retaining Williams microdiskectomy retractor was then placed for appropriate exposure. At L5-S1, in the majority of cases, adequate exposure of the disk was able to be accomplished through excision of the ligamentum flavum without any associated laminotomy. In a small number of cases, a minimal amount of the trailing edge of the L5 hemilamina was resected.

At L4-5 and L3-4 standard microlaminotomies were performed. The operating microscope was brought into the field at the time the ligamentum flavum was incised and resected and utilized until wound closure. The microscopic disk excision was then performed in the standard fashion, first removing any free fragments that might be present, followed by exenteration of the disk space with curettage and pituitary rongeurs. If any foraminal stenosis was present, a foramenotomy was also performed with a Kerosen punch. Hemostasis was meticulously obtained with bipolar cautery and the wound was then irrigated profusely with bacitracin solution. Closure was accomplished in layers with absorbable suture (Vicryl), and steri-strips. Sterile dressings were applied. 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 po fluids, adequate incisional pain control and ability to ambulate and urinate.

Discharge instructions, prescriptions for narcotic pain medication and NSAID's and/or muscle relaxants (in some cases) were given to the patients. A return to work schedule was established with the patients. The earliest returns to work were 3 days post-operatively, and the longest at 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. No patients required post-operative intervention from nausea/vomiting or pain control. None of the patients required post-operative hospitalization. One patient had a minor intraoperative complication. This patient with a recurrent disk herniation had severe epidural fibrosis and a pin-hole opening in the dura was inadvertently made during exposure of the disk. This hole was packed with gel-foam sealing the CSF leakage immediately and the patient did not develop a post-operative headache. She was observed for 8 h in recovery, did not develop postural headache or other symptoms, and was discharged with no further sequelae. Two patients developed radicular pain post-operatively which resolved with a series of 3 epidural steroid injections utilizing Depomedrol. One patient developed a recurrent disk herniation post-operatively.

4. Conclusion

The purpose of this communication is the portrayal of a successful outpatient regimen for lumbar microdiskectomy. Since the follow-up time is very limited (2–16 months), the long-term results can not 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 operated on in the free standing outpatient surgery center have completed patient satisfaction surveys which have routinely depicted a high satisfaction level.

5. Discussion

This series suggests that outpatient lumbar microdiskectomies can be safely performed with the same positive results as experienced following an inpatient procedure. The advantages include a significant reduc-

tion in cost to the patient (and third party payors) and a high level of patient satisfaction. Further studies are needed to confirm these findings.

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Ambulatory Surgery

Breast reduction as a day case

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Abstract

The feasibility of performing breast reduction surgery on an ambulatory basis was evaluated in a prospective study. Of 64 patients presenting for breast reduction surgery, 50 were selected as suitable for day surgery (78%). Of these patients, all were able to be discharged on the day of surgery. The study has shown that it is safe and appropriate to perform breast reduction on an ambulatory basis. Patient recovery is rapid and the complication rate is equivalent to that of other types of breast surgery.

Keywords: Ambulatory surgery: Breast reduction

1. Introduction

Reduction mammoplasty represents one of the clearest examples of the interface between reconstructive and aesthetic breast surgery and is well established as the treatment of choice for symptomatic mammary hypertrophy and/or ptosis (Fig. 1). Patients with mammary hypertrophy commonly present with neckache, backache and shoulder pain due to their excessive breast weight. In addition, many complain of difficulty in buying appropriate clothing, an inability to participate in certain sporting activities, poor posture, submammary intertrigo and often profound self-consciousness.

In 1985, the Royal College of Surgeons of England published a report encouraging day surgery as being cost effective. The report estimated that one third of all general surgical and urological procedures could be carried out on a day case basis. In 1987, the Royal Australasian College of Surgeons published guidelines for the conduct of day surgery [1]. The College listed a number of advantages of day surgery. In addition to the obvious economic advantages, there were significant other advantages, especially for patients and their relatives. These included:

(1) A considerable reduction in the risk of cross infection when compared with patients who remained in hospital.
(2) A reduction in the risk of thromboembolism associated with early ambulation.
(3) Less anxiety for the patient where an overnight stay in hospital is avoided.
(4) A quicker return to normal activities with less time off work.
(5) Less stress for relatives of patients and savings in time, travel and sometimes accommodation required to visit an in-patient in hospital.

With regard to the suitability of patients for day surgery, the College published guidelines as follows:

(1) An assessment that post-operative pain can be controlled by oral medication after discharge.
(2) An assessment that the post-operative course is predictable.
(3) A willingness on the part of the patient to be treated as a day case.

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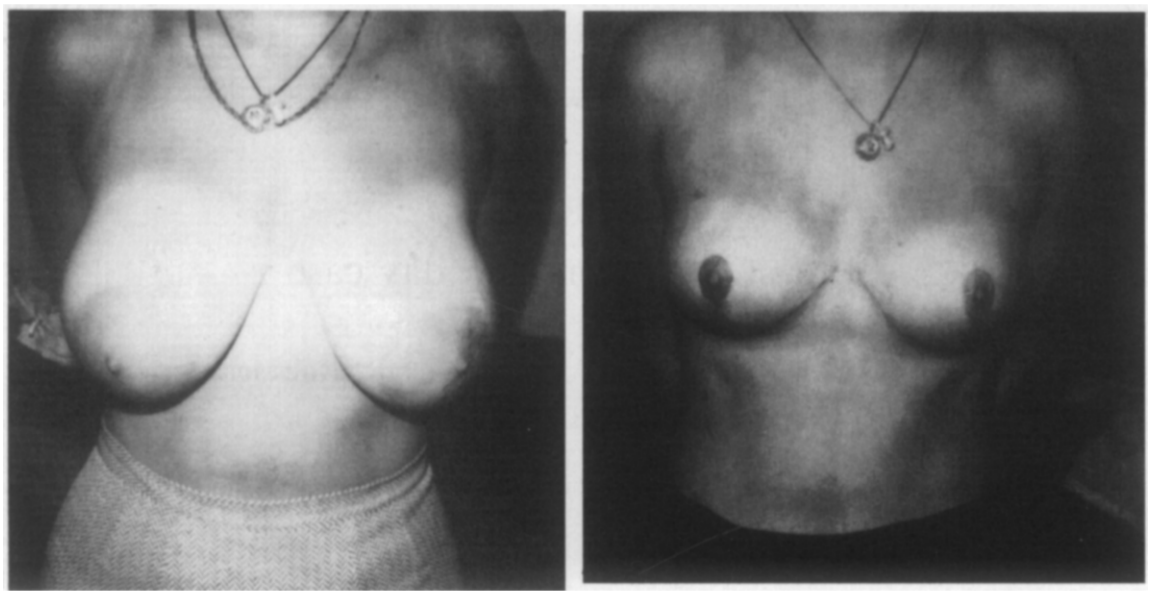

Fig. 1. Pre- and post-operative photographs of a patient undergoing breast reduction.

(4) The provision of transport and a suitable escort for the patient and the availability of a suitable person at home to support the patient.
(5) There should be no language difficulty for the communication of instructions.

A further requirement is that a telephone should be available at home. Furthermore, the patient should live close enough to a medical facility in order to obtain emergency care if required. For practical purposes, it is desirable that travelling time from the facility to home is not greater than about 1 h.

With regard to the suitability of procedures for day surgery, Rudkin et al. [2] stated that the only constraint is that the procedure should entail an uncomplicated recovery. The essential requirements are that the procedure be performed with minimal physiological disturbance, minimal risk of haemorrhage and adequately controlled post-operative pain. Day surgery need not be limited to 'minor surgery'. This was clearly shown in a study by Saltzstein et al. [3] who performed open cholecystectomy as a day case on 44 of 64 eligible patients. He stated that "if incisional comfort can be controlled, the time for recovery and length of post-operative hospitalisation should be the same for open cholecystectomy as for laparoscopic cholecystectomy".

Breast reduction is considered major surgery by most standards. In the past it was not unknown for patients to languish in hospital for up to 2 weeks. Admitted the day before for assessment and cross matching of blood, their surgery was often accompanied by significant blood loss and considerable pain. The result was often a profound physiological disturbance and morbidity. Nipple and skin flap necrosis occurred with disturbing frequency and often necessitated revision surgery. Such scenarios are now unusual and indeed the length of hospital stay for patients undergoing reduction mammaplasty has decreased significantly. This has been due to a number of significant technical advances in breast surgery which have occurred over the last decade.

The use of the central segment technique of breast reduction [4] (in which the nipple is transposed on a central segment of breast tissue rather than on a thin dermal flap) solved overnight the problems of nipple blood supply and viability.

The use of breast infiltration with local anaesthetic and a vasoconstrictor has significantly reduced patients' metabolic stress and blood loss. Significant changes in anaesthesia have also occurred in recent years, particularly in respect of attitude towards day surgery and anaesthetic agents. The availability of propofol and isoflurane has dramatically reduced patients' recovery time and their sense of well-being following surgery. The use of ketorolac has allowed the virtual elimination of narcotics both for pre-operative medication and post-operatively, with a significant reduction in the incidence of post-operative nausea and vomiting.

The availability of these technical advances led us to investigate the feasibility of performing reduction mammaplasty as a day case.

2. Method

The study was undertaken at The Plastic and Aesthetic Surgery Centre — a registered free-standing day

surgery centre owned and operated by the senior author. Patients were selected from those presenting with symptomatic mammary hypertrophy and/or ptosis. Patients were generally excluded from the study for the following reasons:

(1) Advanced age
(2) Ill health
(3) Patients living in a remote area
(4) Patients who were anxious about the thought of day surgery
(5) Patients with social reasons for admission to hospital such as those living alone and unable to provide a chaperone or those with a young family and inadequate home help. Patients were given the option of treatment as a day case or as an in-patient. It was also explained that, in the event that the medical staff considered the patient unsuitable for discharge following surgery, then transfer to hospital would be arranged.

2.1. Technique

Pre-operative photographs were taken and the patient marked while sitting up in order to determine the future nipple position. After induction of anaesthesia, 100 ml of 0.5% xylocaine with 3 ml of POR8 was used to infiltrate the breast tissue in order to reduce both the metabolic response to surgery and blood loss. Following skin preparation with Savlon and surgical draping, a central segment of breast tissue was dissected and preserved. This segment contained the nipple and underlying breast tissue as an intact unit, thus preserving nipple sensation and future ability to breast feed. A reduction of the remaining breast tissue was then performed, followed by haemostasis by electro-coagulation. Blood loss was generally limited to two-lightly moistened large packs. Wound closure was effected by subcuticular suture with the nipple in its revised position and an inverted T submammary suture line. Scar minimisation techniques were utilised where appropriate. Suction drains were routinely used and all suture lines taped with steristrips. Gauze and cotton wool with an overlying crepe bandage were then used to provide a bulky pressure dressing.

Pain management was of critical importance.

In addition to fentanyl 50–100 μg, patients were given ketorolac (Toradol) 30–60 mg parenterally prior to induction of anaesthesia. With this combination, patients usually awoke pain free. Oral fluids were administered when requested, usually within 1 h of surgery. An Orudis SR200 tablet was given 3 h following surgery and subsequently any pain controlled with Panadeine or Panadeine Forte. Prior to discharge, patients were able to take oral fluids and were able to walk with assistance to the bathroom in order to void urine. What little pain there was had been demonstrably relieved by oral analgesics. Patients were given detailed written instructions and a supply of analgesic tablets. Long acting nonsteroidal analgesics together with Panadeine and Panadeine Forte were used to control pain for the first 24–48 h.

A dressing was arranged for the next day, preferably in the surgeon's rooms, but if necessary by a nursing service in the patient's own home.

Drains were usually removed after 2 or 3 days and sutures after 10–14 days.

3. Results

A total of 50 patients underwent breast reduction as a day case. This represented 78% of patients undergoing breast reduction in the senior author's practice over the study period. All patients were discharged home on the day of surgery. Patients ranged in age from 16 years to 72 years with a mean age of 30 years (Fig. 2). The weight of tissue removed ranged from 100 g to 3.7 kg, the mean weight removed being 1158 g (Fig. 3).

Four patients underwent unilateral breast reduction to correct breast asymmetry, while three patients underwent additional surgery as a combined procedure. Total time in theatre ranged from 85 min to 130 min, with a mean of 110 min. Because of time taken for anaesthesia, marking, infiltration and dressings, the actual average operating time for a bilateral reduction mammaplasty was 75 min. Time in the facility ranged from 6 h to 10.25 h with a mean of 7.8 h.

3.1. Complications

Three haematomas occurred in the 50 patients. Two patients were admitted to hospital and the haematoma evacuated under general anaesthesia, while the third patient was readmitted to the Day Procedure Centre and the haematoma aspirated under intravenous sedation anaesthesia.

Delayed healing at the T-junction occurred in 3 patients. Two of these required secondary excision under local anaesthetic, usually at 7–14 days post-operatively. There was, therefore, a total of 6 complications from 50 patients, giving a complication rate of 12%.

All 3 patients who had delayed healing and necrosis of the T-junction were active smokers. In fact, this phenomena occurred in 3 of the 8 patients in the series who smoked. This compared with no healing problems in the 42 non-smokers in the series.

Post-operative vomiting occurred in 6 patients but in only 2 of the last 25 patients in the series.

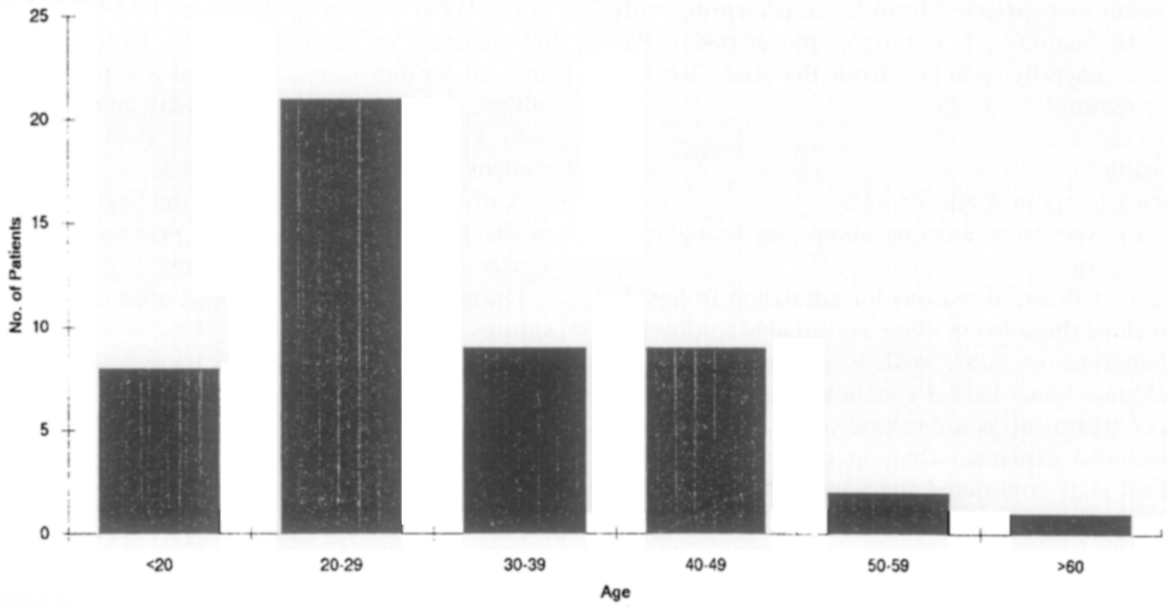

Fig. 2. Patient ages.

Fig. 2. Patient ages.

4. Discussion

In conclusion, this study has proved that it is feasible to perform breast reduction as a day case. Furthermore, this study has shown that even patients with gigantomastia, requiring extremely large reductions (up to 3.7 kg in this series), can safely be treated as a day case. Apart from delayed healing at the T-junction (which was found to occur exclusively in smokers), the only other complication was haematoma which developed post-operatively in 3 of our 50 patients. The haematomas were readily recognised by the patients due to the pain and associated swelling and were expediently managed by admission to hospital for evacuation under general anaesthesia or, in the third case, re-admission to the Day Procedure Centre and removal of the haematoma by aspiration. None of the complications affected the final result.

The fact that 78% of patients undergoing breast reduction over the study period were operated on as day patients indicates that day surgery breast reduction is acceptable to an overwhelming majority of patients. Indeed, the commonest reasons for admission to hospital were psychosocial, i.e., anxiety regarding day surgery or patients with inadequate home help. Patients with private health insurance were more motivated to seek hospitalisation than those without private health insurance for whom the ability to save on hospital costs was a great incentive to organise home help. Many insured patients, however, preferred the option of avoiding hospitalisation as they preferred to recover in their home environment with their families.

With a mean age of 30 years, most patients were fit and healthy. Even patients categorised as ASA III could be rendered suitable for day surgery by adequate control of their underlying health problem. Even elderly patients who are otherwise fit (the eldest in our series was 72 years old) can be safely managed as a day case.

Appropriate anaesthetic management is essential if patients are to be discharged on the day of surgery. Utmost attention must be paid to antiemesis, adequate analgesia with optimal use of non-steroidal anti-inflammatory and opoid analgesics, blood pressure manipulation, rapid emergence and recovery and the maintenance of adequate hydration. Recently introduced drugs such as propofol for induction or for total intravenous anaesthesia, and isoflurane, have dramatically reduced patient recovery time and enhanced their sense of wellbeing following surgery. The perioperative use of nonsteroidal anti-inflammatory drugs has greatly assisted in the pain management of these patients and virtually eliminated the need for potent opioid drugs in the post-operative period.

For many doctors, day surgery is a new system of patient management. The requirement that a patient be fit for discharge home within a few hours of surgery demands quality assurance in every aspect of patient care. The requirements that patients be ambulant, pain free and able to tolerate oral fluids demand a careful analysis of each and every aspect of the surgery and the anaesthetic. Surgical and anaesthetic complications must be kept to an absolute minimum in order to satisfy the fundamental requirement of a predictable post-operative course.

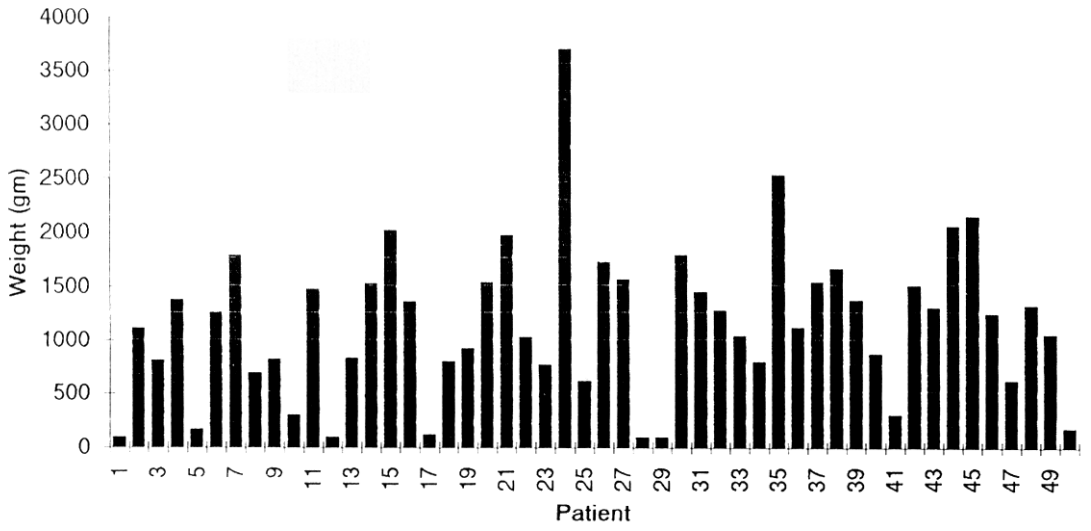

Fig. 3. Weight of breast tissue removed.

The availability of a dedicated day surgery unit with experienced and motivated staff is of critical importance to the development of the techniques required. Just as day surgery is not suitable for every patient, so is day surgery not suitable for every surgeon. Some surgeons may not be prepared for the added responsibility that comes with discharge of a patient on the same day. Unlike the hospital situation where most concerns are likely to be handled by nursing staff and resident medical officers, with day surgery any concern on the part of the patient is likely to result in a telephone call to the surgeon.

Health care currently has quality care and cost effectiveness as its two main objectives. Day surgery meets these requirements. A significant majority of patients prefer this form of treatment as it lessens the psychological stress associated with hospitalisation and enables recovery in the familiar surroundings of their home. The quality assurance essential to the performance of major surgery on an ambulatory basis results in a low complication rate. The availability of breast reduction as a day case has made the operation available to a large number of uninsured patients who would otherwise not be able to afford the cost of hospitalisation. The development of home nursing services and the increased involvement of family doctors in the aftercare of patients will further extend the applicability of this procedure.

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Ambulatory Surgery

Pre-operative screening for sickle cell trait in adult day surgery; is it necessary?

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1. Introduction

Routine pre-operative screening for sickle haemoglobin (HbS) in individuals considered at risk for a sickle haemoglobinopathy is common practice. This has arisen out of the perceived risks in these individuals when undergoing anaesthesia and surgery. Anaesthesia in patients with sickle cell anaemia is potentially hazardous. These patients have a chronic haemolytic anaemia and are symptomatic of their disease in childhood. But it would be unusual for an adult to present for day surgery without this condition having previously been identified. In pre-operative screening of adults, therefore, the purpose seems to be to identify those with the sickle trait, or milder genotypes of sickle cell disease, such as HbSC or HbSβ-thalassaemia, who have not been diagnosed earlier on clinical grounds. The question of whether patients should be routinely screened pre-operatively for the carrier state, sickle trait, is a controversial one [1]. In this review, we discuss the clinical and anaesthetic implications of sickle trait, and the limitations of screening protocols and other issues involved in routine screening.

2. Sickle cell trait

Sickle cell trait refers to the heterozygous state for the HbS gene. It is one end of the spectrum of sickle haemoglobinopathies which includes the homozygous state HbSS (sickle cell anaemia) and the co-inheritance of HbS with other haemoglobin variants (e.g. HbSC disease, HbSβ-thalassaemia). The HbS gene codes for the formation of an abnormal haemoglobin in which valine is substituted for glutamic acid in the 6th position of the β-globin chain giving rise to the relatively insoluble HbS. In conditions of oxygen deprivation, HbS forms crystals which distort the shape of the red cell membrane causing the cells to assume an inflexible sickle shape. These cells may then become stuck within capillary beds generating a vicious cycle of circulatory stasis, acidosis, further hypoxaemia and ultimate tissue infarction [2]. The extent of sickling and the ease with which it is precipitated depends on the percentage of deoxygenated HbS. Hypoxaemia is therefore the biggest risk factor. The individual with sickle trait has 20–45% HbS in the blood. The critical PO_2 at which irreversible sickling occurs is 2.7 kPa. Thus conditions of extreme hypoxaemia are required to precipitate sickling in a patient with the trait. For instance, in an individual with sickle trait who has 40% HbS in his red cells, sickling will begin at 40% oxygen saturation. This is in contrast to the patient with HbSS with 85–95% HbS in his red cells, where the critical PO_2 is 5.5 kPa and some sickling will always occur even with 100% oxygen saturation, and all cells are sickled at 50% oxygen saturation [3].

Acidosis and conditions which promote circulatory stasis such as hypothermia, dehydration and hypotension can also aggravate sickling. Individuals who have co-inherited other abnormal haemoglobins such as those with HbSC and HbSβ-thalassaemia disease also have a greater tendency to sickle than traits [2].

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3. Clinical implications of sickle trait

Sickle trait is a benign haemoglobinopathy that is not associated with anaemia. Individuals with sickle trait are generally asymptomatic. However, they are reported to be at increased risk of the following. A higher risk of splenic infarction at high altitudes of $> 10{,}000$ feet and in unpressurized aircraft; commercial flights where cabin pressures equivalent to ≈ 8000 feet are maintained do not pose any problems. A higher risk of sudden unexplained death with exertion has been reported amongst black military recruits with sickle trait compared to those without. Renal complications such as haematuria, bacteriuria and pyelonephritis in pregnancy are also more common. Sickle trait has been associated with a higher risk of pulmonary embolism [4].

4. Historical background/epidemiology of sickle trait

The HbS gene is most prevalent in equatorial Africa where it has its origins (Table 1). Population migration and interbreeding resulted in genetic drift out of Africa. Clusters of high gene frequency occur elsewhere in the world e.g. in Arabia, India, Israel, Turkey, Greece and southern Italy. This can be attributed to the ancient trade routes connecting the Niger River basin with the Mediterranean Sea, and the power struggles which ensued within Mediterranean domains and subsequent assimilation of the gene into conquering nations. The gene arrived in the Western world with the slave trade initially, and in the last century, with voluntary immigration [5]. Today, ease of international mobility, and intermix of different ethnic groups have resulted in a widening of the gene pool to an extent that the identification of physical or racial characteristics can no longer be the only criteria used to identify those likely to carry the gene, whether in the heterozygous or homozygous form. Patients with sickle cell disease range from individuals with blond hair and blue eyes to those with olive skin and straight dark hair to those with dark skin and curly black hair [5]. In the USA, white patients with sickle cell disease have been identified who have no phenotypically distinguishable characteristic or identifiable African ancestry [6]. Neonatal screening programmes have also yielded interesting results. Cord blood screening of white babies in California revealed a 0.7% incidence of sickle trait. In urban centres in the USA, 10% of patients with various sickling disorders identified themselves as non-black.

Table 1
Gene frequency of HbS in different populations [17]

Country	Frequency
Africa	
Nigeria	0.133
Angola	0.202
Bantu	0.0006
Senegal	0.142
Europe	
Greece	0.012
Portugal	0.0005
Asia	
Saudi Arabia	0.081
Punjab	0.011
Gujerat	0.12
Bangladesh	0.002
Madhya Pradesh	0.086
West Indies (Black)	0.058
USA (Blacks only)	0.042

NB, carrier rate is approximately twice gene frequency.

5. Screening protocols

The recommendations of the General Haematology Task Force of the British Society for Haematology are that pre-anaesthetic screening for HbS should be offered to all patients of African or Afro-Caribbean descent in order to identify individuals with the trait as well as the clinical sickling syndromes [7]. In addition, routine screening of peoples originating from the Middle East, southern Italy, Greece, Turkey, Cyprus and India is also recommended. In the light of recent knowledge, it would appear that the identification of at risk groups is less clear. What should the selection criteria for screening be if individuals with the sickle gene are no longer easily identifiable on the basis of racial or physical characteristics or by country of origin or ancestry?

Screening is recommended for several reasons; to inform affected individuals of health risks, to warn of potential risk to the fetus antenatally, to be able to initiate early effective treatment for sickle cell anaemia in the neonatal period and to facilitate genetic counselling of affected parents. Screening for a condition induces great anxiety. The terms sickle positive, sickle negative and trait are often misunderstood. Therefore, any effective screening programme requires follow-up counselling. This seldom happens in anaesthetic practice. It is not uncommon for patients to remain unaware of their test result. Undoubtedly, this contributes to repeated and unnecessary screening when the patient next presents for surgery.

6. Screening tests: limitations

The sickle solubility test (e.g. Sickledex) is used to screen for the presence of HbS by its precipitation in the presence of a reducing agent. It cannot distinguish

between the trait and disease. Furthermore, in the patient being investigated for anaemia, the solubility test can give a false negative result. False negatives will also arise in babies in the first few months of life. False positives may arise in dysproteinaemic states [7].

Haemoglobin electrophoresis is the definitive screening test. Its value in an emergency is limited because the result is unavailable immediately. A facility for rapid haemoglobin electrophoresis exists but is not cost-effective for the majority of hospitals.

7. The risks of anaesthesia in sickle trait

Concerns about anaesthetic related morbidity and mortality in sickle trait have often been based on anecdotal case reports alleging causality simply by association. In the 1970s, a few of these reports highlighted the risks and focused attention on the peri-operative management of this group of patients [2,8,9]. It led to recommendations such as the need for pre-oxygenation to minimize potential hypoxia during induction, use of 50% oxygen mixtures, continuous oxygen therapy until full recovery, maintaining adequate hydration with intravenous fluids, keeping the patient warm and avoiding the use of tourniquets to create a bloodless surgical field.

A case of cardiac arrest and subsequent maternal death was reported to have occurred during Caesarean section under general anaesthesia [10]. It was postulated that aortocaval compression had occurred, and its relief at delivery allowed the sudden return of hypoxic, acidotic and sickled blood to the heart. The finding of sickled red cells at postmortem is often presented as evidence that sickling was responsible for the complication. However, sickling at or near death is an inevitable event and sickle cells will always be found at postmortem.

Two reports in the literature alleging significant morbidity associated with sickle trait consist of a case of superior sagittal sinus thrombosis [9] and a case of presumed splenic infarction [8] that occurred during recovery from anaesthesia. In both cases, the patients were of Negro origin, and experienced conditions of hypoxia, dehydration and hypotension to an extent which might have been harmful even to patients without the trait. Both cases occurred before the advent of pulse oximetry.

In contrast, two studies have looked objectively at the risks of anaesthesia associated with sickle trait and found no real correlation. Searle reviewed five series of general anaesthetics in sickle trait patients [2]. There were four deaths out of a total of 513 cases. Anaesthesia was attributed as the main cause of death in only one of these cases. This was the case of a 12-year-old Negro boy who died as a result of longitudinal sinus thrombosis thought to have been triggered by a difficult open ether induction. Had the presence of sickle trait been known, the choice of anaesthetic and outcome might have been different. In the three remaining cases, death was attributed to co-existing conditions unrelated to sickle trait e.g. carcinoma of the stomach, an inoperable necrotic haemorrhagic pelvic neoplasm and pulmonary embolism.

In the second study, 56 black patients with sickle trait were matched for procedure, type of anaesthetic, age and sex with black patients with normal haemoglobin [11]. There were no significant differences found in the rate or type of complications, and no difference in the length of post-operative stay. The complications observed did not relate to the anaesthetic or haemoglobin makeup but appeared to reflect the type and severity of the procedure.

8. The risks of tourniquets

The use of a tourniquet to provide a bloodless field during surgery results in circulatory stasis, acidosis and hypoxaemia, conditions known to induce sickling.

These concerns were highlighted in an early case report which warned against tourniquet use [12]. These theoretical concerns were not substantiated in a study of sickle trait patients undergoing orthopaedic procedures involving the use of tourniquets. No significant acid-base disturbances were found, nor was there any evidence of sickling or post-operative complication related to tourniquet use [13]. It was suggested that the use of tourniquets in patients with sickle trait was safe provided that the limb was exsanguinated beforehand.

9. Implications for anaesthetic management

There have been no reports of sickling complications associated with anaesthesia in sickle cell trait patients in the past 15 years. The place of ether has long been relegated to history. Anaesthetic practice has changed since the original reports of anaesthetic related complications of sickle cell trait.

Modern drugs and volatile agents possess better induction and maintenance characteristics and a rapid recovery profile. Improved monitoring techniques such as pulse oximetry and capnography, and in recent years, the AAGBI's recommendations for standards of monitoring during anaesthesia and recovery [14], have all contributed to the safety of general anesthesia in current practice. With pulse oximetry, hypoxia should not go unrecognised even in the dark skinned.

Shorter periods of starvation and fluid deprivation are now actively encouraged, and the use of intravenous fluid rehydration is not so unusual. Modern

theatres are equipped with a temperature-controlled environment and the use of effective warming systems (e.g. Bair Hugger) make accidental hypothermia less likely.

The development of recovery facilities and increased anaesthetic involvement in post-operative management have all led to improved post-operative outcome. In recent years, the introduction of acute pain services have contributed towards safe and effective post-operative analgesia.

Therefore, in the context of modern anaesthetic practice, the conditions which could induce sickling such as hypoxaemia, acidosis, dehydration, circulatory stasis and hypothermia should not occur. It could be argued that a universal standard of safe practice applicable to all patients irrespective of the presence or absence of a haemoglobinopathy should exist. The knowledge of the presence of sickle trait would therefore become irrelevant.

10. Implications for day case surgery

In this context, relatively minor surgery of short duration involving minimal physiological disturbance is performed in fit and healthy patients. A careful history and pre-operative assessment ensures optimal patient selection. Pre-operative investigations should be kept to a minimum. In this context, is the performance of a sickle test relevant to management?

The conditions which could induce sickling should not occur in the course of a well conducted anaesthetic, nor in the recovery period. Appropriate monitoring including pulse oximetry is routine at induction, intra-operatively and in recovery. Hypoxaemia, when it occurs, is usually unexpected and unpredictable. The causes are many and diverse, and include equipment failure and patient-related complications e.g. anaphylaxis, laryngospasm and bronchospasm. In some cases, hypoxaemia may be anticipated e.g. in the very obese, in heavy smokers and in patients with chronic lung disease. In all cases, the treatment of hypoxaemia is directed at the cause and measures taken to minimise the risk of hypoxaemia in those at risk. Sickle cell trait per se is not a cause of hypoxaemia.

In the post-operative period, hypoxaemia has been shown not to be a significant problem following minor surgery [15,16]. Operations which result in severe post-operative pain and risk of significant haemorrhage are excluded as day cases. Day case patients are ambulant immediately before and very soon after surgery which is of short duration. The risk of deep vein thrombosis is minimal.

Day case surgery has to be convenient, efficient and economic. Pre-operative investigations should be performed only where indicated and where the result alters management and improves safety. Otherwise, the adherence to strict screening protocols will inevitably lead to unnecessary cancellations and disruptions to lists and wastage of limited resources.

11. Conclusion

Sickle cell trait is not a disease. It is a benign condition with few, if any, implications on health. It does not have significant implications either surgically or anaesthetically particularly in the context of day case surgery. Is it necessary to screen for sickle trait pre-operatively?

One can argue that the purpose of screening is to detect those individuals with HbSC disease who remain asymptomatic and without detectable anaemia into adulthood. Such individuals, even if identified, would not be managed any differently. As an analogy, we cannot guarantee to identify all patients with asymptomatic ischaemic heart disease, and do not perform routine pre-operative ECGs on patients before day surgery. Fitness for day case surgery is mainly based upon our clinical assessment. Language barriers in ethnic groups can present difficulties. However, better patient education, antenatal and neonatal screening programmes make the individual who remains unaware of a sickle haemoglobinopathy uncommon.

Screening protocols have to be justified on medical, ethical and economic grounds. Current guidelines, where they exist, range from recommendations on screening all black patients pre-operatively, to screening all patients of non-Northern European extraction. The sickling disorders are not confined to black patients but can be found in white patients who are phenotypically indistinguishable from the rest of the population. What criteria should be applied in order to justify screening in a particular racial group?

It is interesting to note that the practice of screening for HbS pre-operatively has not been routine or considered necessary for several years now outside of the UK e.g. in the USA. A careful pre-operative assessment and full blood count evaluation will identify those with sickle cell anaemia, and the rest would not be managed any differently. This practice of applying a universally safe standard of practice to all patients has much to commend it. After all, as anaesthetists we do not wilfully allow our patients to become dangerously hypoxic, acidotic, hypothermic, dehydrated or hypotensive.

We suggest that routine screening for HbS is not indicated prior to day surgery and that formal testing should be confined to patients with clinical or haematological problems where it is relevant to their overall management. Standards of practice have to be based on good scientific evidence and not anecdote. Can we

justify screening for a benign condition which does not alter management? There is no value of screening as defensive medicine. Does failure to test imply negligence? Or is testing any defense for sub-standard anaesthesia?

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Ambulatory Surgery

Short communication

Local infiltration anaesthesia with ropivacaine 0.5% for excision of benign naevi

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Abstract

Ropivacaine is a new type of long-acting local anaesthetic of less systemic toxicity than bupivacaine. The objective of this double-blind study was to compare the efficacy and safety of ropivacaine 0.5% and mepivacaine 1% for infiltration anaesthesia in dermatologic surgery. Sixty out-patients aged 18–65 years, scheduled for excision of a benign naevus on the back, were randomly assigned to infiltration anaesthesia with either ropivacaine or mepivacaine. Both agents had a fast onset, and provided reliable anaesthesia and painfree surgery which could be carried out without the use of vasoconstrictive adjuncts or diathermy. Ropivacaine resulted in a longer duration of analgesia than mepivacaine, and both treatments were well tolerated.

Keywords: Ambulatory surgery; Local anaesthetic; Infiltration; Mepivacaine; Ropivacaine

1. Introduction

Ropivacaine, a new long-acting amide local anaesthetic (LA), is a homologue to the already clinically used local anaesthetics, mepivacaine and bupivacaine. Ropivacaine is unique in being the first LA to be introduced as the pure S-enantiomer, whereas its homologues are racemates. Both preclinical and clinical studies have shown that ropivacaine is similar to bupivacaine in onset and duration of sensory block, while its motor blockade is less pronounced and of shorter duration [1]. It has also been shown that ropivacaine has a lower CNS and cardiac toxicity than bupivacaine [2]. Several clinical studies have demonstrated ropivacaine's suitability for epidural and peripheral nerve blockade in surgery [3,4], as well as for per- and postoperative infiltration in postoperative pain management after various abdominal surgical procedures [5].

Ropivacaine has previously not been used for infiltration anaesthesia in minor dermatologic surgery. In the present study, ropivacaine's suitability as a dermal infiltration anaesthetic agent for minor skin surgery was evaluated.

2. Material and methods

Sixty patients (29 males and 31 females, aged between 18–65 years) were scheduled for ambulatory excision of a single, benign naevus (5–15 mm in diameter) located on the back. Each patient's medical history was obtained and standard physical examination was carried out prior to inclusion in the study. The patients were randomly assigned to either of two parallel groups of 30 patients each for a double-blind comparison of ropivacaine 0.5% and mepivacaine 1.0% when used for intra- and subcutaneous infiltration anaesthesia. 1–5 ml of the study solution were infiltrated before surgery, which started when adequate analgesia was established according to pin-prick testing, performed every 10 s after the end of the infiltration. Additional injection of

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local anaesthetic could be given as needed during surgery.

Time of onset of analgesia was recorded, and the patients were asked to note the time for début of discomfort or pain in the wound area after surgery in order to assess the duration of analgesia.

Pain during the injection of the study drugs and during surgery was estimated by the patients with the aid of a visual analogue scale (VAS) where 0 = no pain, and 100 = worst imaginable pain. The skin colour of the injected area was also assessed, as was the need for haemostatic action during surgery. The overall quality of treatment was judged by the investigator at the end of the surgery. At the follow-up visit approximately 2 weeks after surgery, wound healing was checked and the wounds inspected for signs of complications.

Before discharge from the hospital and at the follow-up visit, the patients were interviewed for adverse events in a standardized way.

Wilcoxon's rank sum test and Fisher's exact test were used as statistical methods. Each test was two-tailed and performed at a significance level of 0.05.

3. Results

The mean dose of ropivacaine 0,5% administered was 2.1 ml (11 mg) (range 1–4 ml) and mepivacaine 1%, 1.8 ml (18 mg) (range 1–3 ml). Onset of analgesia was immediate in all patients but two: one patient in the ropivacaine group had a time to onset of 35 s, the other, anaesthetized with mepivacaine, had a time to onset of 5 s.

The pain scores during the injections were low in both groups. Median VAS score during the injection was 14.5 (range 1–61) mm in the ropivacaine group and 6 (range 0–56) mm in the mepivacaine group; this difference was not significantly different. Four patients (13%) in the ropivacaine group and five patients (17%) in the mepivacaine group had VAS scores above 30. After injection, the local skin colour changed in two ropivacaine-treated (pale and red, respectively) and three mepivacaine-treated patients (pale, pink and red, respectively).

The duration of surgery was short, 2–8 min, and no additional infiltration was needed during surgery. There was no pain at all (VAS score = 0) during the surgical procedure in 56 out of 60 patients. Two patients had a VAS scores of 11 mm and 24 mm, respectively, both in the ropivacaine group. In the mepivacaine group, VAS measured 1 mm and 4 mm, respectively, for two patients. There was no difference in peroperative bleeding between the groups. One patient in each treatment group needed diathermy for haemostasis. The mean duration of analgesia was 3.1 ± S.D. 2.8 h in the ropivacaine group, compared to 2.2 ± S.D. 1.9 h in the mepivacaine group; this difference was not statistically significant.

Wound healing was normal in all patients and the quality of treatment was considered as excellent in all patients.

Five patients in the ropivacaine group and three in the mepivacaine group reported mild adverse events mostly of short duration, e.g. vertigo, nausea, or postoperative burning and itching in the wound area. None of these was considered to be related to the tested local anaesthetics. There were no serious adverse events.

4. Discussion

Excision of a benign naevus is one of the most frequent surgical procedures performed on adult outpatients where solely a local anaesthetic is used. Mepivacaine 10 mg/ml is a drug commonly used for dermal infiltration for this type of surgery. Addition of epinephrine 5 μg/ml is often used to prolong the duration of action and for haemostatic reasons [6]. However, this combination is often more painful at injection than when the plain solution is used, partly due to its lower pH [7].

Ropivacaine is a new long-acting local anaesthetic belonging to the same homologue series of compounds as bupivacaine and mepivacaine. Ropivacaine has a pH of 4.0–6.0 and pharmacodynamic and pharmacokinetic properties resembling those of bupivacaine but with less central nervous and cardiovascular toxicity [1,2]. No data has previously been available concerning the efficacy of ropivacaine for infiltration anaesthesia for minor surgery.

This study of infiltration anaesthesia showed that the overall quality of treatment was excellent with both ropivacaine and mepivacaine. The time of onset of analgesia was immediate in all patients. Pain was minimal during injection and surgery as assessed using a visual analogue scale. There were no haemostatic problems during surgery and diathermy equipment had to be used only once in each group. The duration of analgesia was longer for ropivacaine, although the difference was not statistically significant, probably due to the relatively large variation in duration and the limited number of patients.

In conclusion, for excision of cutaneous naevi, infiltration with ropivacaine 0,5% provided excellent and reliable analgesia with rapid onset and a clinically longer duration of anaesthesia than that of mepivacaine 1%. Ropivacaine seems to be an interesting alternative for minor surgery of longer duration where a local anaesthetic without epinephrine is preferred.

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Letter to the editor

Pre-emptive analgesia implies the prevention of the 'wind-up' phenomenon

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The article by Thomson and Rood [1] entitled 'Pre-emptive analgesia reduces postoperative pain' discusses the importance of providing effective analgesia during the perioperative period. Their study demonstrates that preoperative administration of either tramadol or ketorolac reduces postoperative pain following third molar surgery performed under general anesthesia. Although we agree with the authors' conclusions regarding the relative effectiveness of these analgesic drugs, postoperative pain relief following preoperative analgesic administration does not establish the presence of pre-emptive analgesia. As suggested by the authors in their concluding paragraph, 'the key question, in relation to pre-emptive analgesia is whether analgesic intervention before surgery is more efficient than the same intervention following surgery....'. Thus, the title of their article is misleading to the readership.

McQuay [2] clarified the difference between performing an analgesic intervention before surgery and demonstrating a pre-emptive analgesic effect when he stated that: 'the evidence for or against a pre-emptive effect requires the comparison of the same intervention made before and after the pain stimulus starts..' (Fig. 1). Therefore, a pre-emptive analgesic effect can not be demonstrated when the different analgesics are administered at the same time, (i.e. only prior to the surgical incision). Few studies have actually compared the same analgesic intervention (using opioids, NSAID or local anesthetics) preemptively and at a latter stage of the surgical intervention [3]. The study by Thomson and Reed only demonstrated that preincisional administration of tramadol or ketorolac was able to reduce pain after oral surgery compared to a placebo treatment. While this positive result suggests a worthwhile clinical benefit, it fails to provide evidence for a 'pre-emptive' effect.

Surgical tissue damage leads to a dual phenomenon of central and peripheral sensitization that prolongs and increases sensitivity to noxious stimuli over an expanded receptive field (hyperalgesia), and results in pain from previously innocuous stimuli (allodynia). Repetition of such stimuli leads to a progressively escalating degree of hyperexcitability, which has been termed 'wind up' [4,5]. Pre-emptive analgesia implies that analgesics administered by one or a combination of different routes are able to attenuate stimuli-induced neuroplasticity, which once initiated, may sustain and magnify the pain experience [6,7].

In conclusion, we would suggest that Thomson and Rood perform a follow-up study in which they adminis-

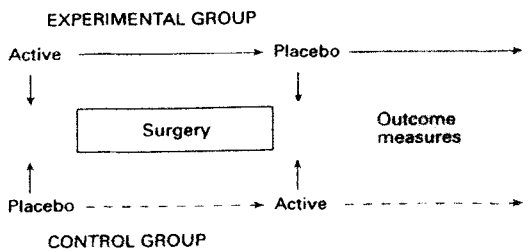

Fig. 1. The design necessary to demonstrate an effect of pre-emptive analgesia [1].

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ter the analgesic drugs (or placebo) before or after the surgical incision and then compare the postoperative analgesic effectiveness. Clearly, additional clinical studies are needed to establish the importance (if any) of pre-emptive analgesia.

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