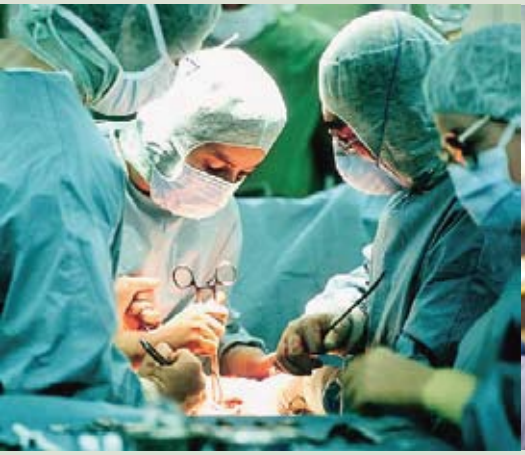
AMBULATORY SURGERY

International Journal covering Surgery, Anaesthesiology, Nursing and Management Issues in Day Surgery

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Editorial

Claus Toftgaard

This is the second fully electronic version of the official Journal for International Association for Ambulatory Surgery (IAAS).

Naturally we still have room for improvements in the technical set-up of the Journal – please feel free to contact the webmaster of the IAAS website if you have proposals for improvements or if you have complaints.

I will also suggest that you visit the website – www.iaas-med.com - in order to learn more about our Association. There are many initiatives taken by the IAAS and the most recent where we together with the European Observatory on Health Systems and Policies have made a Policy Brief concerning ambulatory surgery can be admitted through the web site.

The latest international congress in Amsterdam April this year was a great success. You may read the abstract as an addendum to this Journal. The next congresses in Brisbane 2009 and Copenhagen 2011 have their own websites also available through the website so you have the possibility to keep updated.

In this edition we like to elucidate the history of the IAAS and therefore the first 11 years are described in the first two documents. We also like to stress the conditions for admitting and acceptance of papers for the Journal and have included the instructions for authors. These instructions will also be available at the Internet site of the Journal.

We in the IAAS believe that ambulatory surgery has come to stay – in fact it is the most important contribution to the organisation of surgery in modern time, and in many countries more than 50 % of all surgery is done in an ambulatory setting.

Therefore we find the activities of IAAS important: The congresses, the membership, the initiatives, and last but not least the Ambulatory Surgery Journal. Contributions to the Journal are therefore more than welcome in order to keep this Journal as the most important source for knowledge about ambulatory surgery.

Claus Toftgaard
President, IAAS

Foundation and Early History of the International Association for Ambulatory Surgery 1995–2001

The initiative to establish Ambulatory (Day) Surgery in the International forum can be traced to the First European Congress on Ambulatory Surgery, which was held in Brussels, 8th - 9th March 1991, and organized by Dr. Claude de Lathouwer, President, Belgian Association of Ambulatory Surgery. This was a success with six hundred delegates from 25 countries and it was decided to hold another conference in 1993.

The Second European Congress on Ambulatory Surgery was held in Brussels 19th - 20th March, 1993 during which a group of representatives from interested nations held an informal meeting, convened by Claude de Lathouwer, to consider the formation of an international association dedicated to ambulatory surgery. The proposal attracted strung support and it was agreed that more formal meetings of the group of interested representatives should be organized.

A further meeting was held in London (UK) 17th - 18th September, 1993 and the interested group became the Foundation Committee, which unanimously agreed that the International Association for Ambulatory Surgery should be formed. Claude de Lathouwer was elected Convener. Member nations of the Foundation Committee were as follows: - Australia, Belgium, France, Germany, Netherlands, Italy, South Africa, Spain, Sweden, Switzerland, United Kingdom and the United States of America.

It was also decided that the Association should be registered in Brussels (Belgium) and this would require preparation of a Constitution. Ambulatory Surgery, a journal dedicated to ambulatory (day) surgery practice had been commenced in 1992 with Paul Jarrett (UK) as editor - the first issue was launched in March 1993 during the 2nd European Congress, It was agreed that Ambulatory Surgery would become the official Journal of the Association.

The next meeting of the Foundation Committee was held in Orlando (USA) 9th - 10th May 1994 and this was almost entirely dedicated to drawing up the Constitution, Claude de Lathouwer agreed to prepare a draft Constitution. It was also agreed that the next conference should be held in Brussels, 14th - 15th March 1995 as the First International (Third European) Congress on Ambulatory Surgery.

The Foundation Committee met again on l4th March, 1995 during the First International (Third European) Congress on Ambulatory Surgery and the Constitution was adopted, The following day, 15th March, 1995, formation of the International Association for Ambulatory Surgery was announced at the Congress by Claude de Lathouwer, who had been elected Foundation President. A Foundation Dinner was held the same night.

The main objectives of the Association are - to serve as an international multi-disciplinary forum for the exchange of information and advancement of ambulatorysurgery, to promote education and research, to establish guidelines and to act as an advisory body to all interested parties for the development and maintenance of high standards of patient care in ambulatory surgery facilities.

Claude de Lathouwcr offered to locate the Secretariat of the Association at his office in Brussels and this was gratefully accepted by the Executive, which was formed from the Foundation. Committee. The efforts of Claude de Lathouwer in organizing the Congresses, convening meetings of the Foundation Committee and preparing the Constitution of the Association, were acknowledged by the Executive. He also initiated the important project of collecting international data on ambulatory surgery practice in conjunction with the Organization for Education and Co-operative Development (OECD). This data has been published and continues to be updated.

The Constitution provides that full membership representatives of affiliated nations form the General Assembly, which elects the Executive, and two meetings are held each year. The President and the Executive are elected for two year terms.

The primary challenge for the new Association was to increase membership and lo establish Ambulatory Surgery as the pre-eminent International Journal on Ambulatory Surgery practice. Paul Jarrett (UK) and Tom Ogg (UK) have been tireless in their successful efforts in these projects.

The Second International Congress on Ambulatory Surgery was held in London (UK) 14th - 15th April, 1997. This was a successful Congress with 1100 delegates from 36 countries. The General Assembly/Executive held meetings during the Congress and Paul Jarrett (UK) became President, He initiated the project of preparing international definitions of ambulatory (day) surgery, and co-opted Australia to assist. Membership of the Association steadily increased.

The Third International Congress on Ambulatory Surgery was held in Venice (Italy) 25th - 28th April, 1999 and was a most successful event with 2311 delegates from 41 countries, Tom Ogg (UK) became President. His successful efforts in attracting major sponsorships for the Association significantly contributed to establishing its financial strength. He also prepared the Bid manual for nations to apply to host International Congresses. He identified quality expansion of day surgery as the main objective with increasing effort to expand membership to Asia Pacific, South America and Eastern Bloc nations. The preparation of International Definitions was protracted, however these were finalized in October, 1999 and will be published in Ambulatory Surgery with translations into 11 languages. The important project of developing an education process for ambulatory surgery was established with Italy being delegated the responsibility of preparing a Thematic Network for distant ambulatory surgery education. A Skymcd Pilot Utilization Plan was introduced in September 2000 and preparation of a course of lectures, video tapes and data will then be presented on the internet for world wide retrieval.

Financial management of the Association was delegated to France and the excellent efforts of the Treasurer, Gerard Parmentier, have been recognized by the Executive.

The Association is now well established and continues to expand. The Congresses have been very successful with increasing numbers of delegates. The Third International Congress on Ambulatory Surgery 15 to be held in Geneva, Switzerland 22nd - 25th April, 2001.

At the end of the year 2000 the following countries were affiliated:

Full membership Australia, Austria, Belgium, Denmark, France, Germany, Hong Kong, Italy, Netherlands, Norway, Poland, Portugal, Spain, Switzerland, United Kingdom, United States of America.

Associate Members Australia, Chile, Italy, Hungary, South Africa, Romania.

Individual Members Canada, Egypt, Greece, Latvia, Ukraine.

This unique multi-disciplinary organization will continue to work for the expansion of high quality ambulatory surgery world-wide, especially to those countries that have not yet developed this important procedural service. The achievement of its objectives largely depends on the development of excellent communication channels and to this end has formulated its own website: **www.iaas-med.org**

Ambulatory surgery will continue to expand and the formation of the International Association for Ambulatory Surgery will be recognized as one of the great initiatives in the achievement of its potential.

Council of Presidents
International Association for Ambulatory Surgery

History of the International Association for Ambulatory Surgery 2001–2006

The Association, in its first five years, had become soundly established, both functionally and financially. However the years to follow proved to be more challenging and difficult.

The 4th International Congress on Ambulatory Surgery was held in Geneva (Switzerland), 23rd-25th April 2001. Although the number of delegates was smaller than previously (612), this was a very successful Congress and Lindsay Roberts, Australia, became President.

The Office, which had been located in Brussels (Belgium) for six years, closed in 2001 and was relocated to the building of the Royal College of Surgeons of England, London – a process which took three years to finalize during which the secretariat operated out of 'temporary offices' firstly in Sydney, Australia and then Amsterdam, The Netherlands.

On 11th September, 2001 the world was 'shaken' by the Islamic terrorist attack on the Twin World Trade Centre towers in New York, and on the Pentagon in Washington in the U.S.A. – and the world hasn't been the same since.

The Association's Executive Committee was scheduled to hold a meeting in Wurzburg, Germany on 15th September, 2001 and the President, Lindsay Roberts, directed that this arrangement should proceed, notwithstanding the risks and difficulties imposed on members to attend.

The meeting was attended by seven (of a total 11) members and was very productive, although a personal tragedy was to follow. After the meeting, one of the members, Professor Mare Claude Marti from Switzerland, traveled to Egypt for a week's holiday but suffered a major heart attack from which he did not survive – a very sad loss for his family and the Association.

The prime objectives of the Association to expand its membership and prepare standards for high quality, safe ambulatory surgery practice continued through this troubled period. A major achievement, largely due to the dedicated efforts of Gerard Parmentier (France), was the computerized recording of International Definitions of Ambulatory Surgery in 11 languages, which have been included on the Association's website.

The 5th International Congress on Ambulatory Surgery was held in Boston (U.S.A.), 8th-12th May, 2003. This successful conference of 1336 delegates was notable for its very large trade exhibition of 198 companies. At this time, Dick de Jong, The Netherlands, became President.

Since its foundation, the International Association for Ambulatory Surgery has been registered in Brussels, Belgium, requiring that its by-laws be written (French and English languages) in strict accord with Belgian law and signed by the King. Relocation of the Association's Office and formation of the European Union necessitated re-writing of these by-laws, which was a complex and prolonged process for the President, Dick de Jong, assisted by several other members of the Executive.

The development of high standards of safety and quality in ambulatory surgery centers/units is a prime aim of the Association. Standards for selected aspects of ambulatory surgery had been prepared, however the subsequent publication of a book covering all aspects of ambulatory surgery practice was a most meritorious achievement of the Association. Paulo Lemos, Portugal, was the driving force and coordinator of this project, and his efforts to complete the book "Day Surgery – Development and Practice" (2006) in 12 months were acclaimed by all.

The 6th International Congress was held in Seville (Spain), 24th-27th April, 2005. This successful conference of 1090 delegates will be long remembered for its three hour 'Spanish lunches' each day and the spectacular Congress dinner featuring a traditional Spanish horse show. Ugo Baccaglini (assisted by Carlo Castoro) became President.

Ambulatory surgery has continued to expand in most developed countries around the world and in some of these has reached levels that were never envisaged when the Association was founded in 1995 e.g. 80%-85% in the United States of America, 70%-75% in the United Kingdom. In many countries levels of 50%-60% have been achieved while in others the expansion has been much slower. In most countries ambulatory surgery is carried out in hospitals, some of which have dedicated units, while in others large numbers of freestanding centers have been built e.g. United States of America and Australia – both models are supported.

Education and the dissemination of information is a high priority of the Association, which has established its own website for this purpose – (www.iaas-med.com). The webmaster Claus Toftgaard, Denmark, has recently completed a major upgrade of the website, which will greatly facilitate the Association's efforts in this most important activity.

The Association in collaboration with the European Observatory on Health Systems and Policies has prepared a Policy Brief for the expansion of day surgery in Europe, although it would be equally applicable to any country. The project was initiated by Carlo Castoro and Ugo Baccaglini, Italy, and this excellent document entitled "Day Surgery: Making it Happen" will not only assist the expansion of day surgery, especially in those countries where this high quantity, cost effective surgical service is in its early stages of development, but will also enhance the status of the Association as a world authority on all aspects of day surgery. The Policy Brief will be launched at the 7th International Congress on Ambulatory Surgery, Amsterdam, 16th-18th April 2007.

"Ambulatory Surgery" has been the official journal of the Association for 10 years, edited by Paul Jarrett, United Kingdom, however an important change is that in future the journal will become multidisciplinary and published electronically on the Association's website.

Membership of the Association at the end of 2006 is as follows:

Full Members Australia, Belgium, Denmark, France, Germany, Hong Kong, Hungary, Italy, The Netherlands, Norway, Poland, Portugal, Spain, Sweden, United Kingdom, United States of America

Associate Members Australia, Italy

Individual Members: Canada, Egypt, Greece, Mexico, Peru

Corresponding Members India, Rumania

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Management of Peripheral Nerve Catheters at Home

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Abstract

Home use of continuous peripheral nerve block has increased rapidly in recent years. Factors to consider when setting up a home infusion program include patient selection, equipment, medications, and management of common problems. Attention to the steps outlined in this paper will help anesthesiologists make a comprehensive patient assessment plan, facilitate patient and caregiver education, and assist patients in completing their course of peripheral nerve catheter infusion therapy at home.

Keywords: ambulatory surgery; patient-controlled anesthesia; peripheral nerve block.

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Introduction

Ambulatory surgery has increased considerably in the past 3 decades. Advances in intravenous and inhalational anesthetic agents have helped make outpatient surgery the standard for many types of procedures. Despite the success of ambulatory surgery, many patients experience moderate to severe postoperative pain at home [1].

The idea of a patient's involvement in his or her own postoperative care at home is not novel. Patients have engaged in self-care at home for many years, performing tasks such as ostomy care and care of peripherally inserted central catheter lines and ports. Long-acting peripheral nerve block has improved pain management after orthopedic procedures and facilitated discharge from ambulatory surgery units [2]. However, the benefits of single-shot nerve blocks are often lost within 24 hours after surgery because of the local anesthetic agent's limited duration [3]. Peripheral nerve block through perineural catheters and continuous local anesthetic infusion by lightweight, portable drug infusion pumps allow ongoing intense analgesia for 24 to 72 hours but minimize opioid-related adverse effects.

The use of continuous peripheral nerve block (CPNB) requires appropriate patient selection, education, and planning to minimize the potential risks and to maximize the benefits of CPNB at home. This review focuses on important factors involved in the management of CPNB at home.

Initiation of CPNB at Home

General Indications

As the practice of ambulatory surgery increases, more invasive and painful procedures are being performed. The challenge to anesthesiologists is not only to provide anesthesia that achieves fast home readiness but also to limit unplanned hospital admission because of pain and opioid-related adverse effects.

CPNB at home is often used now as primary analgesia along with multimodal therapy in the management of pain after ambulatory surgery. Most CPNBs are performed for ambulatory orthopedic procedures because of the pain associated with osteotomy. Fortier has shown that pain was responsible for 12% of unplanned admissions and 60% of these were orthopedic patients [4]. The duration of analgesia after a single-shot peripheral nerve block is less than 24 hours, whereas severe postoperative pain can last up to 7 days [5]. Meta-analysis of CPNB has shown that every type of perineural catheter analgesia is superior to opioid analgesia [6].

In addition to providing analgesia in the ambulatory setting, CPNB has been used to facilitate early inpatient discharge after more complex surgical procedures [7,8] in response to insurance companies' limiting hospital stays. Finally, patients with a history of adhesive capsulitis who require immediate and frequent physical therapy after lysis of adhesion or joint manipulation may benefit from the intense analgesia of CPNB.

Patient Selection

Appropriate patient selection is probably the most important factor in performing successful CPNB at home (Table 1). Despite the superior analgesia that CPNB can provide, some patients may be very conscious of their body image and therefore refuse to have catheters attached to their body. For patients who tend to be noncompliant, who are unwilling to participate in pain management other than taking oral pain medications, who are unlikely to follow directions, or who might tamper with medical devices, CPNB may not be the best choice of treatment.

Patients also need to have a responsible adult caregiver, telephone access, transportation, and a clean and safe recuperative environment. A patient living on the fourth floor of an apartment building without an elevator may not be a good candidate for lower extremity CPNB at home. Patients and their caregivers must be willing and active participants in pain management for CPNBs to work well in the ambulatory environment. Unlike the inpatient setting in which trained medical personnel are responsible for patient assessment, treatment of pain, and management of opioid-related adverse effects, patients using CPNB at home must be able to assess their pain level and perform treatment with the assistance of their caregiver.

Short-term postoperative cognitive dysfunction can also be an issue for some patients [9]. Patients with a history of severe dementia or with difficulty communicating are usually not suitable candidates for CPNB. Patients with cultural and language barriers and without the aid of an appropriate caregiver at home may be at risk using home

Table 1 Exclusion Criteria for Continuous Peripheral Nerve Block at Home.

Criteria	Rationale	Examples
Cognitive dysfunction	Difficulty in pain assessment and diagnosis of complication	Multi-infarct dementia, Alzheimer disease, psychiatric disorder
Unreliability	May not or will not follow instructions, unable to follow instructions	Psychiatric disorder, language barrier and no translator available, patient without phone
Lack of home support system	Potential lack of care in case of emergency, perhaps more likely to have complications	Patients living alone, patients caring for a dependent spouse, pediatric patients with unreliable parents
Baseline ambulation difficulty	Increased possibility of trauma from falling	Patient with severe rheumatoid arthritis, history of hemiparesis from stroke, history of weakness from preexisting neuropathies or myopathies
Significant organ dysfunction	Changes in pathophysiology that increased the likelihood of neurologic or cardiac toxicity	History of heart failure with resultant increased perfusion to vital organs, decrease drug or active metabolite clearance during continuous infusion

CPNB because of their lack of ability to communicate with on-call staff in case of emergencies. Risks and benefits of performing CPNB at home must be considered carefully for a patient who has difficulty walking because of an underlying neurologic disorder, has poor balance after previous strokes, or needs to use crutches or a walker.

Surgical procedures that allow a 23-hour postoperative observation period provide another opportunity to assess postoperative cognitive function, educate the patient and responsible caregiver, and help patients understand and prepare for CPNB at home. Although not discussed extensively in the literature, for patients traveling long distances postoperatively, we usually recommend overnight observation in the hospital or at a local hotel. During this additional observation period, many patients are recognized to be suboptimal candidates who must rely on more traditional pain management methods.

In addition to providing pain management for ambulatory surgery patients, CPNB is being used to facilitate early hospital discharge after different types of orthopedic procedures. More data will be available in the future on this particular use of CPNB at home.

Patient and Caregiver Education

In addition to patient selection, appropriate patient and caregiver education ensures patient satisfaction and effective analgesia (Table 2). Important points of education include 1) protection and inspection of the insensate limb; 2) instructions on dressing care, catheter removal, and basic infusion pump function; 3) pain management and use of rescue medications; and 4) management of block and local anesthetic–related adverse effects. Sample forms for both physicians and patients are provided in Appendixes 1 through 4.

Preliminary prospective studies of CPNB at home with proper education of the patient, caregiver, home health nurses, and call staff support the safety of regional anesthesia and discharge with an insensate limb [10-14]. For carefully selected and educated patients, concerns for insensate limbs are often unfounded, probably because most patients' extremities are already immobilized and the block may have minimal effect. Warnings to avoid weight bearing on the blocked limb are also important for lower extremity CPNB, while vigilant observation of the position, color, and temperature of the insensate extremity by patients and their caregivers is required because of the lack of a protective reflex to pain [15].

Patients need to be active participants in managing their postoperative pain and monitoring block or local anesthetic–related adverse effects. Discharge instructions should explain when to administer a local anesthetic bolus through the nerve sheath catheter, when to discontinue drug infusion, and when to take other prescribed medications for multimodal pain therapy. Common indications for discontinuing CPNB infusion are possible signs of local anesthetic toxicity (eg, tinnitus or perioral numbness) and block-related adverse effects (eg, dyspnea unrelieved by sitting up during interscalene catheter infusion or desire to have partial recovery of limb sensation). Patients are encouraged to contact the on-call services if they have questions and concerns. In general, reducing activity and exercising common sense to avoid harming insensate limbs are recommended.

The patient, caretaker, or home health nurse can perform catheter removal at the end of infusion. Complete removal of the catheter should be verified by examining the tip of the catheter and the intactness of the length of the catheter. Some patients prefer to remove the catheter while being supervised by medical staff over the phone [11].

Patients With a History of Opioid Tolerance and Dependence

Acute postoperative pain management in patients who are recovering from substance addiction or who are currently dependent on opioids presents special challenges. Standard medication dosages and strategies are often ineffective in providing pain relief for these patients [16,17]. Appropriate treatment of acute postoperative pain and prevention of relapse are particularly important for the recovering patient. Management of increased opioid requirements, hyperalgesia secondary to reduced opioid dosage, and anxiety related to the fear of inadequate pain management are common issues in patients with increased opioid requirements [18,19].

The benefits of CPNB for opioid-dependent or -tolerant patients, although not well studied compared with the benefits for opioid-naïve patients, can nevertheless be inferred from these data [10,20]. For opioid-dependent and -tolerant patients, the continuation of maintenance opioid medication and other existing medications (such as antidepressants, anticonvulsants [eg, gabapentin], nonsteroidal anti-inflammatory drugs or cyclooxygenase 2 inhibitors, and benzodiazepines) is important to prevent opioid withdrawal and anxiety in the perioperative period.

Patients With Renal or Hepatic Dysfunction

Patients with hepatic or renal dysfunction are not the best candidates in general for regional anesthesia because of underlying hemostasis problems. Although desirable in reducing stress responses in these critically ill patients, continuous local anesthetic

infusion poses considerable risk even with ropivacaine, a safer alternative than bupivacaine [21]. In patients with chronic end-stage

Table 2 Patient Instruction and Education.

Concerns	Examples
Catheter-related issues	
Type of catheter	Interscalene, femoral, axillary, or popliteal catheter
Management of catheter leak or dislodgment	Reinforcement of dressing
Catheter removal plan	By self, caregiver, home health nurse, or under supervision by medical staff over the phone
Block-related adverse effects and management	
Dyspnea, hoarseness, or difficulty swallowing from interscalene block	Decrease or hold infusion for 1 h, suggest resting in chair or recliner to improve pulmonary mechanics
Weakness and lack of control of the blocked limb	Practice limb protection, can decrease infusion rate or hold infusion for 1 h
Limb protection	
Protection of insensate limb	Upper extremity splint, lower extremity braces, or protective shoe wear; use of crutches, walker
Check circulation	Check temperature and skin color to make sure dressing is not too tight
Medications	
Name of the local anesthetic infusion	Ropivacaine, bupivacaine, or levobupivacaine
Signs of local anesthetic toxicity	Mouth or tongue numbess, ringing in ears
Rescue pain medications	Oral opioids, NSAIDs, acetaminophen
Multimodal pain management	Including possible cryotherapy
Pump function	
How to turn on and off	
Protect reservoir from sunlight, heat, and water	
Check for signs of infusion	
Contact phone numbers	
On-call staff must have patient's phone number	
Patient or caregiver must have contact number of the on-call service or home health care nurse	

NSAID, nonsteroidal anti-inflammatory drug.

liver disease, clearance of ropivacaine is 60% lower than it is in healthy subjects. Therefore, more than 2-fold higher steady-state plasma concentrations are expected during continuous infusion. In addition, during continuous ropivacaine infusion, patients with chronic end-stage liver disease are expected to have a steady-state plasma ropivacaine concentration more than double, at a given infusion rate, that of healthy subjects. Also, the 4-fold-longer ropivacaine half-life (about 11 hours) in patients with chronic end-stage liver disease should be taken into consideration if repeated ropivacaine doses are used in these patients. For patients with end-stage renal disease, the concern with continued local anesthetic infusion is higher plasma concentrations of free ropivacaine than the plasma concentrations in nonuremic patients. Another concern in these patients is the accumulation of cardiotoxic metabolites.

Pediatric Patients

Recently, continuous regional analgesia has been used in pediatric patients to treat or to minimize disabling behavioral and psychological pain associated with complex regional pain syndrome I or postoperative pain [22,23]. CPNB is usually initiated under general anesthesia with minimal complications [24]. Indications for CPNB in children are similar to those for adults with intense postoperative pain, painful physical therapy, or complex regional pain syndrome [22,25]. Techniques for performing pediatric CPNB were summarized in a recent review [22,24].

Contraindications to CPNB in children are similar to those in adults. Parental and/or patient consent must be obtained before starting CPNB. In adult patients, the infusion rate is mainly limited by the type of infusion pump; a rate of 0.2 mg/kg per hour is recommended for children [25]. Patient- or parent-controlled local anesthetic bolus, although possible, has not yet been studied in pediatric patients.

Selecting the Appropriate Type of Catheter and Infusion Technique for Home Infusion

Upper Extremity Procedures

Single-catheter techniques often provide complete analgesia for upper extremity procedures. The choice of catheter depends on the site of the surgery. Interscalene catheters are indicated for shoulder-related

Table 3 Examples of Published Infusion Regimens.

Author	Catheter	Procedure	Initialbolus	Infusion	Rate
Sandefeo 2005 (41)	Posterior approach, interscalene, 20- to 22-gauge catheter, 3-4 cm into the sheath	Shoulder surgery	20-30 mL of ropivacaine 0.75%	Ropivacaine 0.1%	C, 5-10 mL/h B, 5 mL LO, 20 min
Ekatodramis et al 2003 (40)	Interscalene, 2-3 cm into the sheath, catheter tunneled 4-5 cm from insertion site	Shoulder surgery	30 mL of ropivacaine 0.75%	Ropivacaine 0.2%	C, 2, 6, or 9 mL/h
Ilfeld et al 2002 (52)	Infraclavicular, 3 cm into the sheath	Procedures distal to the elbow	50 mL of mepivacaine 1.5% with clonidine, epinephrine, and sodium bicarbonate	Ropivacaine 0.2%	C, 8 mL/h B, 2 mL LO, 20 min
Nielsen et al 2003 (68)	Interscalene, 5 cm into nerve sheath	Shoulder surgery	30-40 mL of ropivacaine	Ropivacaine 0.2%	C, 10 mL/h
Ilfeld et al 2003 (69)	Interscalene, 5 cm into nerve sheath	Shoulder surgery	40 mL of mepivacaine 1.5% with epinephrine and sodium bicarbonate, 100 µg of clonidine	Ropivacaine 0.2%	C, 8 mL/h B, 2 mL/h LO, 15 min
Kline et al 2000 (70)	Interscalene, 10 cm into nerve sheath or as far as possible	Open rotator cuff, biceps tenodesis	30 mL of ropivacaine 0.5% with epinephrine	Ropivacaine 0.2%	C, 10 mL/h
Casati et al 2003 (71)	Interscalene, 4-5 cm into nerve sheath	Open shoulder surgeries	30 mL of ropivacaine 0.5% or levobupivacaine 0.5%	Ropivacaine 0.2% or levobupivacaine 0.125%	C, 6 mL/h B, 2 mL LO, 15 min, up to 3 doses per hour

procedures such as shoulder arthroscopy, arthroscopic rotator cuff repair, open rotator cuff repair, or proximal humeral procedures. However, interscalene catheter insertion and maintenance remain technically challenging [26-28]. New approaches and tunneling of perineural catheters help prevent catheter dislodgement [29].

For patients undergoing elbow-related procedures and for those with a history of decreased lung function, axillary or infraclavicular catheters are better choices than interscalene catheters because of the lack of phrenic nerve paralysis. Procedures of the forearm, wrist, and hand can be managed with axillary or infraclavicular catheters. Although infraclavicular and axillary blocks are equally effective, infraclavicular block seems to cause less discomfort and is associated with a lower incidence of accidental vessel puncture than axillary block in the single-shot approach. In addition, the infraclavicular site may be easier to care for during catheter inspection by the patient and home health nurses [30].

Supraclavicular block is associated with considerable risk of pneumothorax, and patients may remain asymptomatic until hours after discharge from the hospital or ambulatory surgery center. Thus, supraclavicular block is not commonly performed for outpatient surgery [31,32]. This approach to the brachial plexus, although ideal for procedures involving the entire upper extremity below the shoulder joint, should be performed after careful consideration and in the absence of safer alternatives [31]. Preliminary data on

ultrasound-assisted supraclavicular block are promising, but it is not clear at present whether ultrasound techniques facilitate catheter placement [33,34].

Lower Extremity Procedures

Unlike the brachial plexus, the anatomy of the lower extremity peripheral nerves precludes complete analgesia with single-catheter techniques. Depending on the site of operation, 1 peripheral catheter, either femoral or sciatic, is usually selected for home infusion therapy. Analgesia for a wound that is not covered by a single CPNB is achieved with conventional oral medications.

Different approaches to the lumbar plexus such as femoral or psoas catheters can be used to provide analgesia after arthroscopic ligament reconstruction [35,36]. Psoas catheters are theoretically less likely to dislodge, are located in a "cleaner" insertion site compared with femoral catheters, and provide for better coverage at the obturator nerve distribution. However, they may result in serious complications such as epidural or spinal spread of local anesthetic [37]. Psoas catheters are commonly used for the management of pain after hip-related procedures [38].

Table 4 Published Infusion Strategies for Sciatic Catheters.

Author	Study	Surgery	Initial bolus	Infusion	Rate
Singelyn et al 1997 (72)	Popliteal sciatic	Foot	30 mL of mepivacaine 1% with 1:200,000 epinephrine	Bupivacaine 0.125%, 0.1 μg/mL of sufentanil, 0.1 μg/mL of clonidine	C: 7 mL/hr
Ilfeld et al 2002 (52)	Popliteal sciatic	Distal to knee	50 mL of mepivacaine 1.5% with 125 mg of epinephrine, 100 μg of clonidine, 5 mEq of bicarbonate	Ropivacaine 0.2%	C, 8 mL/h B, 2 mL LO, 20 min
di Benedetto et al 2002 (73)	Subgluteal sciatic	Foot	20 mL of ropivacaine 0.75%	Ropivacaine 0.2%	C, 5 mL/h B, 10 mL LO, 60 min
di Benedetto et al 2002 (73)	Popliteal sciatic	Foot	20 mL of ropivacaine 0.75%	Ropivacaine 0.2%	C, 20 mL/h or 5 mL/h B, 5 mL LO, 60 min
Rodriguez et al 2006 (39)	Popliteal sciatic	Hallux valgus repair	20 mL of mepivacaine 1.5%	Levobupivacaine 0.125% or 0.0625%	C, 3 mL/h B, 3 mL LO, 60 min

There are different approaches to the sciatic nerve as well. Sciatic nerve block at the mid thigh such as popliteal block can provide excellent analgesia after foot and ankle procedures with minimal motor block to the semimembranous muscles above the knees compared with the Labat and parasacral approaches [13,39].

We believe that an approach for lower extremity CPNB at home that causes the least amount of muscle weakness prevents injury to the insensate part of the limb. However, this opinion needs to be balanced with other factors such as the anesthesiologists' comfort level in performing the nerve block, the patient's ability to assume the proper position during placement of the catheter, and the anesthetic plan relative to the use of nerve block as primary anesthesia for the surgery. The major concern with lower extremity block is fall secondary to lower limb weakness from CPNB.

Equipment

Selecting a Needle System and Catheter for CPNB at Home

The ideal needle system is easy to use and has a low failure rate. Two popular needle systems are the insulated 18G Tuohy needle with continuous catheter insertion system and the cannula-over-insulated needle technique [40,41]. No comparison data are available. Depending on the clinician's level of experience, both systems can be reliable in facilitating the placement of perineural catheters. Placement of perineural catheters has traditionally been performed after injection of a large volume of local anesthetic via the block needle. Alternatively, nerve block can be achieved by injecting the local anesthetic through the perineural catheter.

Despite the success of initial nerve block via the block needle or catheter, the lower volume of dilute local anesthetic used for secondary analgesia may not provide adequate analgesia if the catheter tip is too far from the nerve. Some studies have reported a 10% to 15% secondary failure rate [42], which introduces a major concern about using CPNB at home. Secondary block failure is recognized as the lack of analgesia during infusion of dilute local anesthetic via the peripheral nerve catheter [43,44]. Large case series have demonstrated the failure of secondary block in up to 10% of patients [26]. Lack of satisfactory anesthesia after injection of local anesthetic indicates an improperly positioned catheter before initiation of CPNB.

The ease or difficulty of catheter advancement past the block needle tip alone is not an adequate indicator for optimal catheter positioning, as demonstrated by a contrast study [45]. At present, the definitive method of confirming catheter placement near the target nerve is to establish primary block though the catheter. If the primary nerve block is established through the block needles first, the effectiveness of the catheters is not known for sure until resolution of the primary block. For inpatients with established intravenous access, parenteral opioids can be given to assist in pain management and to limit adverse effects of the opiates, although undesirable effects can be monitored and treated. Delayed diagnosis of secondary block failure after ambulatory surgery can lead to severe pain and delay in achieving pain control with oral medications, as the initial nerve block begins to resolve. The use of stimulating catheters has been advocated by some investigators in the hope of decreasing secondary block failure rates [39, 46, 47]. Preliminary comparisons of the success of stimulating versus nonstimulating catheters for primary and secondary nerve block have shown no significant difference between them [48, 49]. Nevertheless, some advantages of using stimulating catheters include shorter block onset time and increased quality of the nerve block compared with nonstimulating catheters [46, 50]. As with other new devices, differences in application techniques may lead to disparate results. The use of real-time stimulation as the catheter exits the tip of the block needle is being advocated to further improve catheter placement using the stimulating catheter technique. Further study is needed to decide whether the use of stimulating catheters decreases the secondary block failure rate for every type of peripheral nerve block. For practitioners using nonstimulating catheters and attempting to establish nerve blocks through perineural catheters, the injection of dextrose 5% in water instead of local

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considered are the pump's bolus and basal capabilities, programmability, reservoir volume, disposability, unit cost, temperature sensitivity, and log-interrogation functions [52-54]. Currently available pumps are of either the elastomeric or the mechanical, battery-powered type.

An elastomeric pump consists of a disposable container with an inner elastic bladder that can be filled with the local anesthetic agent. They are also described as balloon or spring vacuum pumps. The flow rate of the elastomeric pump is set by the diameter of the flow regulator. These are simple in design, relatively inexpensive, and easily explained to the patient. In vitro evaluation of elastomeric pump flow rates showed a significant increase in the infusion rate when the temperature at the flow regulators was increased [54]. In addition, an increase or decrease in pump height can increase or decrease the infusion rate when elastomeric pumps are used [54]. Ilfeld et al [54] usually recommend that their patients wear the elastomeric infusion pumps around the shoulder using the carrying devices made for the pumps to eliminate variations in pump height. To control the temperature factor, during the summer months in Florida, we routinely advise patients to stay indoors during CPNB at home because the high ambient temperature can increase pump flow rates unintentionally.

According to manufacturers' recommendations, elastomeric pumps are nonrefillable. A new generation of elastomeric pumps has a large reservoir volume (about 500 mL) for 3-day infusions as well as the capability to deliver a patient-controlled local anesthetic bolus. Several clinical studies found elastomeric pumps to be easy for patients to use and effective in providing CPNB at home, despite the inaccuracy of the flow rate [10,12,55-57].

A major factor affecting the flow rate of mechanical pumps is battery life [54]. Overall, mechanical pumps allow greater flexibility in programming infusion therapy. However, despite this advantage, many patients do not feel comfortable changing the pump setting can produce concentration-dependent reductions in nerve blood flow by 20% to 35% in laboratory studies [87]. Continuous infusion of clonidine at 1 μg/mL did not decrease breakthrough pain intensity [12].

No current data support the addition of an opioid to the CPNB infusion. Peripheral opioid receptors are located primarily on the terminals of primary afferent neurons, and their expression is enhanced in the presence of inflammation, which may be exacerbated by CPNB catheters located proximally to these axons [88,89]. Overall, dilute local anesthetic alone works well.

Securing the Perineural Catheter

After catheter placement, sterile liquid adhesives and sterile tape are used to secure the catheter to skin. Small to moderate amounts of local anesthetic leakage around the catheter insertion site are common. Sterile gauze pads can be placed above the sterile tape and under the sterile occlusive dressing to absorb some of the local anesthetic. Tunneling of the perineural catheters using a shielded catheter or the 18G insulated Tuohy needle has been used for interscalene catheters that are difficult to secure because of shallow depth from skin to the brachial plexus at the neck area.

Follow-up Care

Well-thought-out follow-up care after discharge is critical to maintaining CPNBs at home. Follow-up care can be performed by telephone calls by designated anesthesia personnel or by visits from home health care staff who are familiar with the common adverse effects and management of CPNBs. The goal during follow-up assessment is to answer specific questions encountered after discharge, to reassure the patient and caregiver, and to ascertain any change in the patient's condition that may warrant discontinuation of CPNB at home. The spouses of elderly patients may not be able to take on the additional responsibility of CPNB at home, and for these patients, home healthcare is appropriate. For younger patients, options are a designated caregiver and home health care provider.

Education of Regional Catheter Service Staff

The regional analgesia follow-up team in the teaching hospital setting often consists of an anesthesiology resident and a specially trained nurse caring for patients with peripheral nerve catheters. The regional analgesia team callback numbers should be available to patients on their discharge orders. A member of the regional catheter team should call the patient daily and document phone assessment. For phone follow-up, nurses working in a pain clinic or on the hospital pain service should be familiar with block techniques, complications, and medications. Some patients do well without further instruction, and others are more comfortable with a follow-up phone call the night after surgery [11]. It is not clear whether follow-up phone calls reduce the need for contact with the on-call physician or home health care nurses [11].

Education of Home Health Care Nurses

Nurses from home health care agencies may need additional education on the rationale for use of CPNB, anatomy of the block, sites and duration of expected sensory and motor changes, pump operation, infusion strategies, symptoms of local anesthetic toxicity, problems and complications, catheter site evaluation, catheter removal technique, appropriate oral analgesic dosing and adverse effect management, and updating the patient's record. Preprinted peripheral nerve catheter orders should be available for home health care nurses. Agencies need to be contacted in advance and orders must be faxed before the patient's discharge. Nursing assessment of motor sensory function, catheter site, and pain control must be performed by a registered nurse. The daily duties of the home health care nurse include assessment of the catheter, tenderness at the catheter insertion site, the portable infusion pump, the patient's verbal pain score (range, 0–10), and any adverse effects. Documentation should include peripheral nerve catheter site, infusion system, adverse effects, and pain scores.

An on-call anesthesiologist usually serves as a backup resource for the home health care nurse. The home health care nurse can perform catheter removal.

Potential Complications Related to CPNB

Although needle- or catheter-induced trauma and local anesthetic toxicity have been identified as anesthetic-related risk factors [90] in peripheral nerve blocks, the presence of preexisting neurologic deficits, perioperative positioning, tourniquet ischemia, and surgical traction may also contribute to nerve injuries. Theoretically, the risk of neurologic complications may increase because of catheter-induced mechanical trauma compared with that of a single-shot nerve block. However, a retrospective review by Bergman et al [58] showed that the risk of neurologic complications associated with continuous axillary blocks is similar to that of single-dose techniques. Symptoms such as hypoesthesia or paresthesia can occur but with complete resolution between 36 hours and 10 weeks after the procedure [91].

Localized Tenderness and Infection at the Catheter Insertion Site

Localized discomfort in the area of the nerve sheath catheter insertion

site has been reported after CPNB [11]. Bacterial colonization of the peripheral nerve catheter is common, but the risk of abscess formation is low [91,92]. Localized infection is usually self-limiting and resolves after catheter removal [91,92].

Local anesthetic myotoxicity, if not attributable to localized infection or surgery-related issues, is a clinically rare complication associated with peripheral nerve blockade. The discomfort around the catheter insertion site can be readily attributed to the operation itself or, alternatively, may be caused by local anesthetic myotoxicity, but concealed by surgical pain. Although experimental effects in animals are clearly intense and reproducible, clinically there are few reports of myotoxicity in patients after local anesthetic administration via peripheral nerve block [93]. Most reported cases were related to dental injections and ophthalmic blocks for cataract surgery [94-96]. Histologic studies in animal models showed that hypercontracted myofibrils become evident within minutes after injection, followed by lytic degeneration of striated muscle sarcoplasmic reticulum, myocyte edema, and myonecrosis over the next few hours. These effects are considered to be reversible because myoblasts are not affected by the local anesthetic agents and can therefore regenerate within 2 to 4 weeks [96]. In experimental models, local anesthetic myotoxicity has been described after administration of all local anesthetic agents with a drug-specific and dose-dependent rate of toxicity [96]. Histologically, bupivacaine appears to cause the most local anesthetic myotoxicity, and the least myotoxicity occurs with ester-type local anesthetic agents such as tetracaine and procaine [93]. A study of local anesthetic myotoxicity in animals with CPNB with equipotent dilute bupivacaine and ropivacaine infusions without initial bolus of a large dose of local anesthetic by Zink et al [94] showed destruction of myocytes with obvious signs of fiber regeneration. The animals in the ropivacaine group had a much lower rate of acute myotoxicity compared with those in the bupivacaine group.

Overall, the clinical impact of local anesthetic myotoxicity is controversial. Many anesthesiologists do not consider local anesthetic myotoxicity a genuine clinical problem because skeletal muscle injuries after the application of these drugs remain clinically unapparent in most cases and are typically reversible within several weeks. It is not clear at this time if continuous local anesthetic infusion postoperatively, whether patients are hospitalized or not, contributes to additional myotoxicity after the initial block with higher doses of local anesthetics. Nevertheless, local anesthetic myotoxicity remains a rare complication after peripheral nerve block and CPNB.

Difficult Catheter Removal

Difficulty during catheter advancement has been reported with knotted femoral and infraclavicular catheters that required surgical removal with subcutaneous incision [11,97]. There has also been 1 reported case of nerve entrapment by the wire from the stimulating catheter that also required surgical removal of the catheter [14].

Financial Considerations

Any discussion of the management of CPNB at home would be incomplete without providing some information on the financial aspect of the practice. The main factors to be considered are the expense of the home infusion pump and the local anesthetic agent for continuous infusion at home. Our hospital cost for 3-day infusion of ropivacaine is approximately US $58 (US $19.33 per 200-mL bottle of 0.2% ropivacaine), and the cost to the institution for a portable infusion pump ranges from US $325 to $400. Thus, at our institutions, the total cost for providing a 3-day infusion of CPNB is approximately US $383 to $458. Infusion pump costs vary, depending on the type of pump (electronic vs elastomeric), the pump manufacturer, and the number of pumps purchased by the institution. The infusion pump and ropivacaine are not separately reimbursable items for Medicare patients, although they may be covered by other third-party insurers. The amount of reimbursement for non-Medicare patients depends on contract negotiations or patients' insurance policies.

Discharging patients with CPNBs has financial advantages for the institution. A conservative estimate of overall hospital costs for a teaching hospital is $1,000 to $1,200 per day for surgical inpatients when the hospital is not at full occupancy. When occupancy is high and beds are in demand, delayed discharge of patients is an obvious lost opportunity. For Medicare patients, the expense to hospitals of providing the pump and local anesthetics are easily offset by the cost savings realized by discharging patients early and minimizing unplanned readmission due to poor pain control.

Finally, unrelated to hospital costs for CPNB at home is the cost for home health care visits. Home health care is sometimes needed for elderly or patients with special needs. For homebound elderly patients who have satisfied the criteria for home health care, Medicare covers home health nursing visits. The amount of home health care reimbursement depends on the level of care the patient requires, as determined by the home health care nurse's assessment during the initial visit. For non-Medicare patients, home healthcare–related reimbursement depends on each patient's insurance carrier and the type of health care coverage.

Conclusions

In summary, CPNB at home as part of multimodal analgesia after surgery provides analgesia that is superior to conventional treatments. The efficacy and advantages of CPNB over traditional therapy such as opioid medications has been demonstrated by multiple randomized, prospective studies in the past 5 years and a recent meta-analysis of 19 randomized controlled trials [6]. The keys to successful completion of CPNB at home are comprehensive patient assessment initially, followed by patient and caregiver education, and postoperative follow-up care. Initial clinical studies of CPNB at home focused on safety, feasibility, and efficacy, and more recent studies have evaluated complications and improved equipment such as stimulating catheters and ultrasound-assisted techniques to decrease the rate of secondary block failure and perhaps improve the quality of block by reducing local anesthetic infusion doses. Additional studies are under way on the potential of CPNB to improve rehabilitation and to decrease the incidence of postoperative chronic pain syndrome. The use of CPNB at home is a growing trend in the United States and worldwide, in both teaching institutions and private practice, and the positive effect on patient satisfaction and health care costs suggests this trend will continue.

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Infiltration with ropivacaine decreases postoperative pain following extraction of third molar teeth in ambulatory surgery

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Abstract

Background: molar teeth extraction induces moderate to severe pain that could be prevented by local infiltration with long acting local anaesthetic.

Patients and Methods: In a prospective double-blind randomised, placebo-controlled single- centre study we assessed the efficacy and safety of 0.75% ropivacaine for postoperative pain relief in 110 patients undergoing ambulatory surgery for extraction of third molar teeth under general anaesthesia..

Results: Patients given ropivacaine had lower maximum visual analogue pain scores (VAS) during the first 6 postoperative hours and a longer delay before the use of rescue medication (P<0,001).

Conclusion: Local infiltration with ropivacaine provides effective postoperative analgesia lasting for 6 hours after third molar teeth extraction.

Keywords: ambulatory surgery; patient-controlled anesthesia; peripheral nerve block.

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Introduction

Impacted molar teeth extraction is a common procedure performed in young adults [1]. It is responsible for moderate to severe pain in the immediate postoperative period [1]. Infiltration with long-acting anaesthetics has been demonstrated to produce postoperative analgesia lasting for several hours following various surgical procedures [1]. Bupivacaine, which is commonly used in this setting, conveys a risk of central nervous system and cardiac toxicity [2–6],that is less important with ropivacaine, a long acting local anaesthetic with a better safety profile [7]. In the current study, we assessed the efficacy of local infiltration with a 0.75 % ropivacaine solution to provide pain control after impacted molar teeth extraction.

Methods

ASA I-II adults patients, scheduled for patients bilateral impacted mandibular molar teeth extraction under day case general anaesthesia were included in the study after local ethical committee approval. Patients were allocated randomly in two groups before anaesthesia, using a random numbers table, to receive ropivacaine(7.5mg/ml) or isotonic saline solution for local infiltraion. All the patients were premedicated with 50-100 mg of hydroxyzine and received 2 g of amoxycilline and of 2mg/kg of solumedrol before surgery. Anaesthesia was performed with propofol for induction and maintained with sufentanil boluses (up to 10µg) desflurane, and nitrous oxide 50 % in oxygen. Local infiltration with ropivacaine or saline was performed after anaesthetic induction For each mandibular molar tooth, 2.0 ml of the allocated solution were infiltrated close to the inferior alveolar nerve and 1.0 ml in the surrounding soft tissue. Surgery was performed by a single surgeon using a standard technique, bone being removed by a water-cooled bur in a surgical drill. All patients were discharged on the same day, after 6 hours period of monitoring in the recovery room.

Postoperatively, patients received tramadol 100 mg intravenously when they complained of pain(VAS> 30) . Paracetamol, 2 g every 6 hours, was given systematically after hospital discharge. Pain intensity was assessed postoperatively on a visual analog scale, graded from 0 (no pain) to 100 (the worst pain imaginable Pain measurements were performed at 30 min, 1, 2, 6, 12 and 24 hours after completion of surgery, and at the time of i.v. tramadol administration. All patients were asked to complete a diary card for 24 h, reporting the VAS scores. The primary outcome aimed to detect a 50% difference between VAS scores in the both groups Surrogates were the time of first rescue medication (tramadol) administration, the percentage of patientswho required i.v. tramadol, the percentage of patients who did not require pain treatment during the first 24 hours, , the maximum VAS score measured postoperatively and the VAS scores at 6,12 and 24 h postoperatively .

Group size (55 patients per group) was selected by using proportion samples size estimates (power = 95%, = 5%) to detect a 50% difference in VAS scores that we expected to be at the advantage of infiltration with ropivacaine. A Mann-Whitney U-test was used for comparison of demographics. Statistical analysis used a two-way analysis of variance for VAS scores; when a difference was documented, a post hoc Scheffé's F test was performed for intergroup comparisons. Categorical variables were analyzed with a 2 test. Values are reported as mean ± standard deviation excepted for VAS expressed as mean ± standard deviation

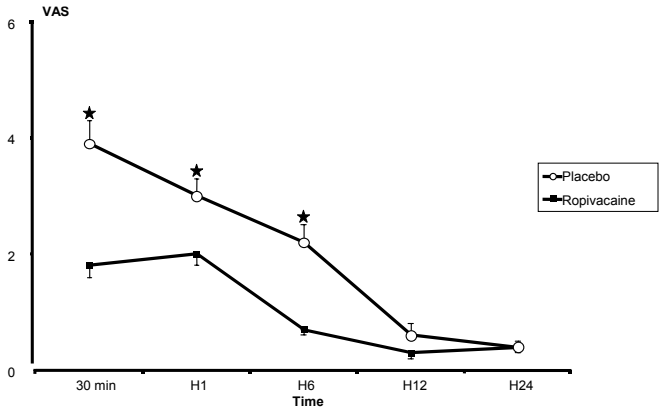
Results

110 patients (55 in the placebo and 55 in the ropivacaine group) were included in the study. Demographics were comparable in the two groups (Table 1). VAS scores were significantly lower in the ropivacaine group during 6 hours (figure 1). The maximum VAS scores was higher in the saline group (39 ± 23 vs 18 ± 19 at 30 min – $p < 0.05$; 30 ± 17 vs 20 ± 17 at one hour – $p < 0.05$ and 20 ± 22 vs 7 ± 11 at six hours– $p < 0.05$) but not after (6 ± 11 vs 3 ± 8 at 12 hours and 4 ± 8 vs 4 ± 9 at 24 hours in the saline and ropivacaine groups respectively). The percentage of pain-free patients was higher in the ropivacaine group (67% vs 35%; $p < 0.001$) . The time to the first tramadol administration was longer in the ropivacaine group (4h versus 1h).

Table I Characteristics of patients. Data are expressed as means ± SD excepted for the number of third molar extracted reported as median [extreme].

	Ropivacaine (n=63)	**Placebo (n=45)**
Age (years)	19 ± 7	20 ± 8
Sex (M/F)		
Height (cm)	166 ± 8	166 ± 8
Weight (kg)	56 ± 11	59 ± 13
Third molar extracted (n)	4 [2-4]	4 [2-4]

Figure 1 VAS for pain during the first 24 hours. Data are expressed as mean ± SEM (* $p < 0.05$ versus ropivacaine) faire une figure avec des SD et respecter les temps de mesure des scores VAS.



Discussion

Postoperative pain control is critical in ambulatory surgery patients for it has been documented to be the primary cause of delayed or impaired hospital discharge [8]. This is because third molar extraction is a common procedure with pain frequently moderate or severe in intensity, and with sufficient numbers of patients to make studies relatively easy to perform [9]. In patients operated under general anesthesia and who do not receive any local infiltration,intravenous paracetamol or morphine are needed to treat postoperative pain [10].

The current study supports that local infiltration with ropivacaine versus placebo is effective to control postoperative pain after third molar teeth extraction.: VAS scores and analgesic consumption are lower in the ropivacaine group when compared to saline group . These results are in accordance with a previous study comparing infiltration in the same purpose with 2.5 and 7.5mg of ropivacaine. Only ropivacaine at 7.5 mg/mL produced sufficient anesthesia The onset of pulpal anesthesia occurred less than 10 minutes after injection and lasted for 2 to 6 hours [11]. The same drug was able to achieve a reduction of pain scores for 10 h with a single dose wound infiltration after shoulder surgery [12].

The importance of postsurgical blockade on the prevention of sensitization leading to increase pain at later time points is illustrated by the blockade of pain with bupivacaine when compared with lidocaine or sodium chloride in the well-designed study edited by Gordon et al [13]. Though most of the local anesthetics used are short-acting and it reduces their interest to prolong analgesia In this indication ,lidocaine was shown to be efficient no more than 2 hours when compared to others local anesthetics [6] . Bupivacaine, a local anesthetic agent widely used in surgical and obstetric practice, has a longer duration of action than lidocaine with a time of onset of anesthesia as rapid as lidocaine [14,15] .The duration of analgesia is considerably extended when bupivacaine is used, and as a result patients have less postoperative pain [16,19] . Even if ropivacaine appears to be less potent than bupivacaine in term of length of analgesia [20], preclinical studies suggest that it presents a lower arrhythmogenicity than bupivacaine [21]. This study shows that ropivacaine could be useful as a local anesthetic for molar extractionin dentistry in ambulatory surgery and that the very long duration of both pulpal and soft tissue anesthesia may be favorable in reducing postoperative pain.

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Day Surgery: Trends for Breast Cancer Surgery and Readmissions in Canada, 1986–1999

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Abstract

Background: The extent to which breast conserving surgeries (BCS) and mastectomies are conducted in day surgery in Canada is unknown. This study explored temporal and age-related trends in the performance of breast cancer surgeries as day procedures. Hospital readmissions for day surgeries and in-patient surgeries were compared. Methods: Breast cancer separations between 1986 and 1999 treated by mastectomy or BCS were identified in the Discharge Abstract Database. Proportions of surgeries performed annually in day surgery were estimated nationally, provincially, and by age-strata. Thirty-day readmission rates, including the reasons for readmission, were compared for in-patient and day procedures.

Results: Day surgery use increased from 8.7% to 41.0% between 1986 and 1999. Most of this increase was due to BCS (57% were done in day surgery in 1999). BCS conducted in day surgery was more common in women 40 to 69 years old in the 1980s; variation by age disappeared by 1996. Few mastectomies were done in day surgery (5.9% in 1999) and rates varied little by age strata. In 1986, 60% of day surgeries resulted in readmission and 44% in 1999. The most common readmission reasons for day surgery procedures were completion mastectomies, further BCS, or lymph node excision.

Interpretation: Day surgery use for breast cancer surgery, particularly for BCS, has increased dramatically. As of the late 1990s, rates of BCS performed in day surgery no longer vary by age. Day surgery readmission rates were higher than for in-patient surgery and follow-up surgeries were the main readmission reasons.

Keywords: Breast cancer, breast conservation, mastectomy, day surgery.

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Introduction

A worldwide shift has occurred towards progressively earlier patient discharge from hospital after surgery. In many countries, day surgery, where patients are sent home the same day as the surgery, is now the predominant venue for surgical procedures [1,2]. In Canada, an estimated 70% of surgeries were done in day surgery in 1995/96 [3].

Among Canadian women, declining length of hospital stay (LOS) has been reported over the last two decades for breast conserving surgery (BCS) and mastectomy from a mean of 8 to 2 days and from 11 to 3 days, respectively [4]. Empirical evidence indicates that early discharge is not, in general, associated with excess surgical complications, including axillary seroma formation [5–9], wound infection [5,6,9,10], swelling of the arm or hand [9,11], drain site infections [12], or restricted shoulder movement [9]. Moreover, early discharge actually appears to confer physical and psychological advantages to patients, including better emotional adjustment [13,14], earlier regaining of independence [16], and earlier return to work [6,14,15] or to other normal activities [14].

Exploring this shift is important as limited data exist regarding the extent to which breast cancer surgery is performed in day surgery in Canada. Also, almost 22,000 Canadian women are diagnosed with breast cancer annually, making it the most common non-skin cancer amongst women [17]. Most of these women will require surgical intervention [16]. As the population ages, the demand for surgery will inevitably increase since about half of breast cancer cases are in women 60 years of age or older [17]. Early hospital discharge is a comparatively safe practice but little is known about the consequences of these procedures specifically when performed in day surgery. The objectives of this study were to explore the provincial, age-related, and temporal trends of breast cancer surgery conducted as day surgery in Canada and to compare the readmission profiles for breast cancer surgeries conducted in day surgery or in-patient settings.

Methods

Separations in the Discharge Abstract Database (DAD) with a primary diagnosis of female breast cancer between 1986/87 and 1999/2000 were identified using the International Classification of Diseases, Ninth Revision (174.0 to 174.9). The DAD is a repository of hospital in-patient and day surgery events in all Canadian provinces and territories, except for Quebec and part of Manitoba. Cases treated by mastectomy (97.12 to 97.19) or BCS (97.11, 97.27 to 97.28) were selected using the Canadian Classification of Diagnostic and Therapeutic Procedure codes.

The fiscal year extends from April 1 of a given year to March 31 of the following year. For convenience the fiscal year will be referred to as single years, for example fiscal year 1986/1987 will be referred to as 1986 and fiscal year 1987/1988 as 1987, etc..

The proportion of BCS and mastectomies done as day surgery between fiscal years 1986 and 1999 were calculated by province and by 10-year age strata. This analysis was limited to British Columbia, Saskatchewan, Ontario, Prince Edward Island, and Newfoundland

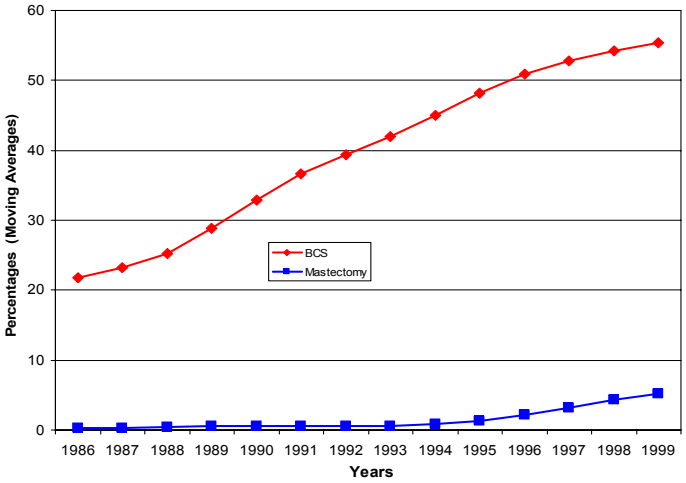
since day surgery information was unavailable for other provinces before 1990. The relatively few cases for women under 40 years of age were excluded from the analysis. As the data were event-oriented, it is possible for an individual woman to be counted multiple times if she is admitted more than once in a year. Three-year moving averages were used to depict general trends.

Data from the DAD were used to calculate the 30-day readmission rates for 1993 and 1999 and to determine the reasons for readmission by original venue stratified by surgical type. Data for these two fiscal years were available for the above five provinces plus Nova Scotia and New Brunswick.

Results

Between 1986 and 1999, the proportion of breast cancer surgeries conducted in day surgery rose almost five-fold from 8.7% to 41.0%. This growth was mainly attributable to an increasing use of day surgery for BCS. In 1986, day surgery was the venue for 21.1% of BCS, increasing to 56.8% in 1999 (Figure 1).

Figure 1 Proportion of Breast Conserving Surgeries and Mastectomies by Day Surgery in Canada.



In 1986, considerable variation in day surgery use occurred provincially, with less than 10% of BCS performed as day surgery in Saskatchewan and Newfoundland, ranging up to 40% in British Columbia (Figure 2a). Over the subsequent decade, rates of day surgery for BCS increased in all provinces except B.C. This upward trend slowed in the mid 1990s and by the end of the observation period, the proportion of BCS performed as day surgery ranged from 40% to just over 60%. Until the mid1990s, the use of day surgery for BCS was more common for women age 40 to 69 years than for those age 70 years and older (Figure 2b). The age difference was largely eliminated by the late 1990s.

By contrast, the proportion of mastectomies performed in day surgery was much lower, reaching a high of 5.9% in 1999 (Figure 1). Provincial rates remained essentially constant at less than 1% throughout the entire period, except for Ontario where day surgery was the venue for almost 8.0% of mastectomies in 1999. The use of day surgery for mastectomy did not vary significantly between age groups over time (data not shown).

In 1993 and 1999, women were more likely to be readmitted when day surgery was the venue for the original surgical procedure compared with in-patient surgery (Table 1). However, between 1993 and 1999 the 30-day readmission rate for day surgery procedures had declined from 59.5% to 44.3%. The majority of the decline could be attributed to a marked improvement over time in readmission rates for mastectomy-day surgery patients.

Figure 2a Proportion of BCS Performed in Day Surgery by Province.

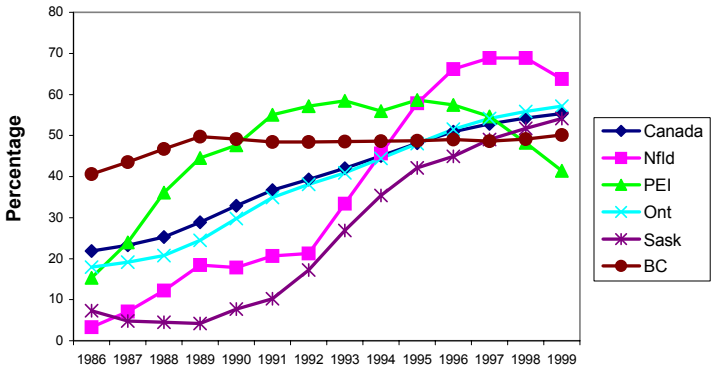


Figure 2b Proportion of BCS Performed in Day Surgery by Age Strata.

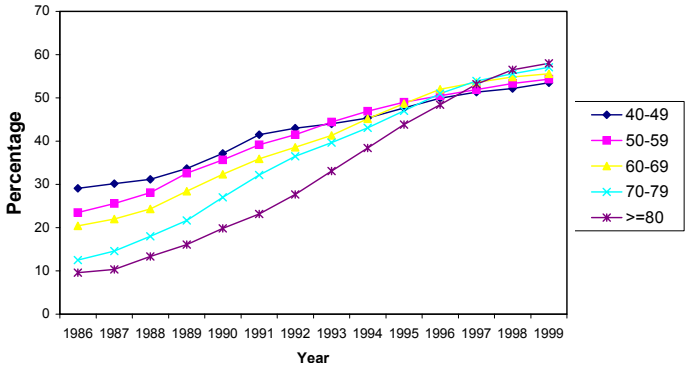


Table 1 Breast surgery readmissions within 30 days after the first readmission.*

Year	Venue of First Admission	Number of Surgical Procedures	Number of Subjects readmitted, N(%)
1993	In-Patient	6105	647 (10.6)
	Day Surgery	2744	1632 (59.5)
1999	In-Patient	7084	736 (10.4)
	Day Surgery	4586	2030 (44.3)

* Limited to women 50 years and older

In 1993, about 60% of cases were readmitted following BCS performed in day surgery compared with 14.4% of cases who had in-patient-BCS (Table 2a). By 1999 the day surgery readmission rate had declined to 45.5% with little change in the in-patient rate. Of the few mastectomies performed in day surgery in 1993, 41.7% resulted in hospital readmission compared to 6.4% for mastectomies performed in in-patient care (Table 2b). In both time periods women who underwent day surgery procedures, either BCS or mastectomies, had a greater probability of readmission for either a completion mastectomy, further conserving surgery, or a lymph node excision compared to women having in-patient surgery.

Discussion

Temporal Trends

All provinces experienced an upward trend in the use of day surgery for BCS. Several factors may be involved. BCS use increased temporally and superseded mastectomy as the most common surgical procedure to treat early stage breast cancer [18]. As surgeons became more familiar with BCS they may have also felt more

Table 2 Reasons for readmission from breast surgery within 30 days after the first admission.*†

a Readmission after breast conserving surgery by venue of first admission in 1993 and 1999.

	1993				1999			
Reason for readmission	**In-patient care (3198)§**		**Day surgery (2720)**		**In-patient care (3304)**		**Day surgery (4413)**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Follow-up surgery‡	320	10,0	1536	56,5	315	9,5	1856	42,1
After surgery care	44	1,4	41	1,5	59	1,8	62	1,4
Post-operation infection	13	0,4	-	0,1	23	0,7	8	0,2
All others	85	2,7	42	1,5	67	2,0	82	1,9
Total	462	14,4	1622	59,6	464	14,0	2008	45,5

b Readmission after mastectomy by venue of first admission in 1993 and 1999.

	1993				1999			
Reason for readmission	**In-patient care (2907)**		**Day surgery (24)**		**In-patient care (3780)**		**Day surgery (173)**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Follow-up surgery‡	17	0,6	6	25,0	22	0,6	7	4,0
After surgery care	61	2,1	-	16,7	95	2,5	9	5,2
Post-operation infection	19	0,7	-	0,0	40	1,1	-	1,2
All others	88	3,0	-	0,0	115	3,0	-	2,3
Total	185	6,4	10	41,7	272	7,3	22	12,7

*Limited to women 50 years and older †Cells with 5 or fewer events are indicated with a dash
‡Follow-up surgery refers to completion mastectomy, further breast conserving surgery, and lymph gland excision
§Indicates the number of women undergoing surgery in a particular venue and year as indicated.

comfortable performing this less invasive procedure in day surgery. Additionally, acute care hospital beds have been closed as a means of cost-containment in the Canadian health care system [19], which contributed to declining LOS and eventually to discharge within 24 hours. Shortened LOS may afford substantial monetary savings [10,13,16,20]. It is projected that implementing home-based care for patients with early stage breast cancer would save $20 million for BCS and $13 million for mastectomies annually in Canada [20]. Finally, development of new anesthetic practices and anti-emetics that hasten post-operative recovery may have made early discharge more feasible [21-23], since post-operative pain [24,25], nausea [25], vomiting [25], and dizziness [25] are the most common causes of delayed discharge after day surgery.

Inter-provincial variations in the LOS following breast cancer surgery has been previously reported [4]. B.C. adopted the use of day surgery for BCS earlier than other provinces, which could be a sign of more drastic cost-cutting measures in that province.

Age Trends

By the late 1990s, women 70 years and older appeared to have essentially the same likelihood of undergoing BCS-day surgery as younger women. Several explanations for this trend are possible. The realization of the potential economic advantage of day surgery and the probable increased availability of home health care services [26], may have intensified the push towards same day hospital discharge [21]. As a result, selection criteria for day surgery may have become more inclusive and patients who in the past would not be considered suitable, for instance, sicker patients and elderly patients, may have been discharged from hospital sooner [26-28]. Further, elderly women, who are most likely to develop breast cancer, may also fear hospitals and prefer same day discharge [13]. Older women are also less likely to undergo axillary lymph node dissection than younger women [29-33]. This component of both mastectomy and BCS is the one that causes the most discomfort, the need for drains, and the limited arm mobility that have traditionally kept women in hospital for several days after surgery.

Being of older age should not preclude women from day surgery [34,35]. Nonetheless, the observed increasing use of day surgery for older women is a potential concern because older breast cancer patients are more likely to have one or more co-morbidities [36-38] and to live alone. It has been suggested that both these characteristics may be relative contraindications for day surgery [10].

Readmissions

Women operated on in day surgery for breast cancer had a higher 30-day readmission rate, especially those who had BCS, compared to women operated on as in-patients. There is little published information about the readmission rates of women discharged early after breast cancer surgery. Previous studies, which did not have comparison groups, found that early discharge after breast cancer surgery had either no readmissions [7,16,34] or very low readmission rates [10]. These earlier studies were relatively small, the time intervals over which readmissions were monitored were not reported, and with one exception [7], the studies did not include women who had BCS. Only two studies, both conducted in the United States, involved day surgery procedures [16,34]. Hence, earlier studies may not be entirely applicable to the present analysis.

A relatively large proportion of women treated in day surgery was readmitted for follow-up surgery. However, these readmission rates must be interpreted with caution as they may not necessarily represent poor care but rather a normal course of treatment based

on findings from the initial surgery. For instance, re-admission for further surgery may be related to pathological findings of margin involvement or discovery of invasive disease when the pre-operative suspicion was in situ disease alone. Procedural coding errors may be another potential explanation for the high readmission rates found in this study. Specifically, some initial biopsies may be coded as BCS with the subsequent definitive BCS then mistakenly deemed a readmission.

Caveats

Early discharge may not be suitable for all women [11], for instance, women with grave comorbidities, psychiatric problems, and those without support at home [10]. Before a woman is discharged early, the availability of home support, including emotional support and access to community nurses should be considered [39]. Further, the patient and her family must be thoroughly informed before and after surgery [13,34]. Pre-surgery education alleviates patients' fears and enhances feelings of personal control [13]. Inclusion of family members in the education process promotes understanding of the disease and the surgery, improves acceptance of the surgery, increases families' feelings of usefulness, reduces familial anxiety, and enhances support for the patient [13,34].

Study Limitations

This study was retrospective and used data that, although collected prospectively, were not specifically collected for this study. Trends were estimated from available provincial data and may not completely represent the Canadian context. We were unable to examine patient-related correlates of day surgery use, besides age. Provincial variations in health services provision, such as the availability of home-based care and the availability of in-patient beds, were not considered. Reasons for readmission were relatively crudely categorized in some instances. Our data should not be used to estimate complication rates since women may have been treated for complications not requiring hospitalization and would not have been captured by our data source.

Interpretation

This study demonstrates that day surgery is the predominant venue for BCS in Canada, that age does not appear to limit women undergoing BCS in day surgery and that day surgery readmission rates are relatively high, consisting mainly of follow-up surgeries. These findings lay the groundwork for the future examination of more in-depth issues as they relate to breast cancer day surgery in Canada.

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