AMBULATORY SURGERY

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

The Official Clinical Journal of the
INTERNATIONAL ASSOCIATION
FOR AMBULATORY SURGERY

VOLUME 23.1 JANUARY 2017

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VOLUME 23.1

Editorial

Mark Skues, Editor-in-Chief

2017 brings a new edition of the *Journal*, together with news of the upcoming biennial congress, to be held in Beijing in May of this year. The 12th Congress will be held at the Beijing International Convention Centre between 8th and 10th May 2017, with all details available from the website

www.iaascongress2017.com

The meeting promises to be an outstanding overview of both the science and art of ambulatory surgery management and well worth your attendance and participation. It seems fitting therefore, that the journal provides a précis of the forthcoming delights available at this meeting.

Luc Van Outryve offers a Guest Editorial, where he elucidates the differences between Day Surgery, Fast Track Surgery, Enhanced Recovery and Perioperative Medicine. Given that Luc will be delivering the prestigious Nicoll lecture in Beijing, I suspect his offering may well be a precursor for his forthcoming presentation.

Huajie and colleagues describe a series of nearly 4000 patients from Shanghai who underwent malignant thyroid surgery evaluating costs, complications and duration of stay. Their rationale for review was that a prospective payment system had been introduced with an aim to reduce length of stays and day to day costs. Over the period of review, length of stay reduced by nearly two days, with a gratifying 10.8% of patients staying less than 24 hours. Total costs were also significantly reduced by nearly 2000 Yuan ($285), confirming that ambulatory care reduced both costs and stay.

Gys et al provide an offering from Belgium comparing the motor and sensory effects of spinal prilocaine, 2-chloroprocaine and bupivacaine for hernia repairs. Somewhat predictably, they note the evanescent effects of prilocaine and 2-chloroprocaine compared with bupivacaine, suggesting an advantage for ambulatory surgery, as long as the duration of surgery doesn't exceed the duration of block. Thankfully, for their series, this didn't occur, though they note that some degree of intraoperative pain is possible, particularly with the use of 2-chloroprocaine.

And finally, orthopaedic surgeons from Milton Keynes (UK) have submitted a paper evaluating pain scores after hip and knee replacement to provide a pragmatic view of not only whether mean pain scores for six weeks after surgery offer the potential for ambulatory arthroplasty, but whether those with persistent pain may have been predicted earlier? While the latter question can't be answered by this paper, the gratifying progressive reduction in pain for six weeks after joint surgery does suggest that hip and knee replacements may be feasible for admission, operation and discharge over the course of one day.

Hopefully, the next edition of the Journal will include details of the free paper submissions for Beijing. I hope you will be able to attend, and look forward to seeing you there.

Mark Skues

Editor-in-Chief

Guest Editorial

The links between Day Surgery, Fast Track Surgery, ERAS and Perioperative Medicine

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When James Henderson Nicoll (1863 – 1921) started to follow up the results of the outpatient surgical treatment he undertook on children at the Dispensary of the Sick Children's Hospital, in Glasgow, Scotland [1], he never had any idea that a 100 years later, the IAAS would be founded to promote his concept of day surgery worldwide.

In the meantime, and especially during the last decades, other concepts developed that joined the rationale of performing surgery without an overnight stay. These ideas are the new principles of performing surgery, based on new techniques: surgical and anaesthetic, but also with new management strategies. Basically, all these concepts are following a better knowledge of the normal natural processes of human life, or of life itself.

The questions are:

- What is the link between Fast-track Surgery and Day Surgery?
- What is the link between ERAS and Day Surgery?
- What is the link between Perioperative Medicine and Day Surgery?

All these concepts are inseparable and a Centre for Perioperative Medicine should focus on optimising the combination of fast track surgery concepts, enhanced recovery after surgery (ERAS) principles and the concept of performing surgery without overnight stay.

The **"Day Surgery"** concept begins when the patient has his first contact with the GP with establishment of a diagnosis and beginning the organisation of surgical treatment. At this time the concept of Ambulatory Surgery (AS) or Day Surgery (DS) starts functioning and finishes only when the patient's problem is resolved and they are back at work.

The **"Fast Track Surgery"** process covers the period from the entry of the patient on the day of surgery until he leaves the facility. To achieve a successful fast track surgery pathway, we need assessment of preoperative organ dysfunction and subsequent optimization. The principles of Fast Track Surgery are also usable for short stay and even for in-patient situations.

The **"Enhanced Recovery after Surgery (ERAS)"** principle is the combination of handling, techniques and use of drugs to optimise recovery after surgery with or without anaesthesia. The ERAS starts before the surgical intervention and ends when the patient is back to his daily situation (back to work). This principle is also useful for short stay and in-patient situations.

The function **"Perioperative medicine"** begins when the patient enters the Centre for the first time, namely for their preoperative assessment and ends when they, after leaving the facility, have either returned for postoperative control or after postoperative telephone call control.

A Business Dictionary defines Fast Tracking as follows:

FAST TRACKING = to do more things in the same time in order to finish a job earlier than normal or planned . . . it is the process of reducing the number of sequential relationships and replacing them with parallel relationships.

For medical purposes this definition seems not to be a good one, because doing different things at the same time could be dangerous in surgery. This definition focuses on "Fast" and not on the "Quality" of the tracking or on the "Safety" of the tracking.

For use in medical or surgical treatment, comparison with the Formula One racing is more preferable:

- an engine, specially built (with protective constructions, with special tyres for rainy or dry weather) passes around a certain "track"
- the track is constructed (special pavement, with banked bends, special S curves , with safety system) to allow the fluent passage of the special build engines

A well-prepared patient goes through a certain "pathway". This "pathway" is constructed around a surgical or medical problem that can be solved by performing an operation (or a medical treatment) and allows a fluent passage through the procedure by strictly following the described rules.

The patient has to go through this track in a safe way, with no or minimal damage and if possible, in a rapid way.

FAST TRACK SURGERY (FTS)

Kehlet definition: *" Fast track focuses on enhancing recovery and reducing morbidity by implementing evidence in the fields of anaesthesia, analgesia, reduction of surgical stress, fluid management, minimal invasive surgery, nutrition and ambulation"* [2].

So, FTS focuses on what is going on, in and around the operation room, or by extension in the Day Surgery (DS) facility just before, during and immediately after the operation.

During the last 50 years, there has been a change in our behaviour because of better knowledge of human physiology and patho-physiology: medicine is still an empirical science, where you only can learn by observation of the normal situation and especially what we see as the abnormal situation, from which the replacement of traditional approaches by evidence based practices has demonstrated an acceleration of recovery.

So, why shouldn't we search for methods that gives the needed care but also provides quality and safety and is even cheaper?

The "Fast Track Surgery" model is a multimodal approach, incorporating not only surgeons, but everyone involved in the care team of an OR and with the following basic components:

- Applying the traditional care principles (prevention of infections, use of drains and tubes)
- Using appropriated surgical and anaesthetic techniques
- Reduction of surgical stress (hydration, minimally invasive techniques, anti–ileus interventions)

- Pain relief

For every procedure there are specific recovery issues:

- From the surgical view: for example, a knee operation demands other postoperative care compared with an abdominal procedure;
- Post-operative mobilisation is not the same for hip surgery as for abdominal surgery; minimally invasive (depending on the length of the incision used) means faster recovery because of less pain in mobilizing postoperatively;
- Postoperative mobility is in connection with the damage on the muscular abdominal wall: therefore minimal abdominal wall access or remote access is used
- From the anaesthetist's view: depending from the kind of narcotics used, recovery will be faster: in combination with local or loco regional anaesthesia, recovery time is shortened and the total amount of drugs used is lowered. Short acting drugs and techniques will allow early awakening and faster recovery. If necessary local implanted devices for continuing pain relief can be used.

The principle of **"Fast Track Surgery"** studies the way it works:

- the way of functioning of the human body.
- the way how to act, following as well as possible the natural way of reaction of the human body
- the way of giving support to the natural reaction process, after the body has been damaged by an intervention (operation) from outside
- this process can be accelerated (enhanced).

Enhanced Recovery after Surgery (ERAS)

The use of the principle of "Enhanced Recovery After Surgery (ERAS)" started following the introduction of a clinical pathway to accelerate recovery after colonic resection [3].

Since then, multiple articles have been written and many studies have been published about this issue. Many protocols have shown improvement of recovery, the decrease of the complications and the reduction of length of stay after surgical interventions.

The initial intention was to implement this principle of ERAS only to colonic resection, but it has now still spread to other operations.

One Day Surgery

Current one day surgery started with the principles of James Nicoll, i.e. " ….to recover after the operation, children were sent to their familiar environment with the visit of a nurse….".

His statement was "for enhanced recovery, young children are better at home with their mother". Day Surgery is an organisational concept: it is trying to organize a pathway for a certain procedure in such a way, that, normally done in three days, with growing experience, can be done in two days or even in one day.

Preparation and organisation are needed, and the patient has to understand the pathway they will follow. Start with planned and well described simple procedures, and only with such procedures to avoid destabilisation of the OR surgery programme. Together with the experience, you develop the ability to use the basic elements for more sophisticated operations.

The one day concept organises the ideal pathway, with in mind a minimal disruption of normal, natural processes and thinking about a return home without overnight stay.

Perioperative Medicine

Perioperative Medicine bundles all the acts that are to be done in the peri-operative period and uses the principles of fast track surgery (FTS) and ERAS and day surgery (DS). Perioperative medicine should be called: how to perform modern surgery in an evidence based way. Put together all the knowledge about the normal functioning of the human body with the knowledge about new interventional techniques: thus, perioperative medicine will teach how to use all these principles to reach an enhanced postoperative result.

Fast track surgery is faster than what surgery is used to be, but in fact it is only following the natural way that the body reacts in normal, natural situation. The track is passed quicker (faster) through; not that the surgery is faster but the way to do the surgical intervention or treatment is done at a more optimised speed. And this is due to better construction of the Formula One car and the more adapted race track, namely the better prepared patient and the better constructed and organised surgical and anaesthetic pathway.

Day surgery is performed without overnight stay, because the damage caused by the operation is treated with techniques that mimic the natural restoring processes.

Put all this in a good organised concept, specialised concept, a niche concept, a day surgery concept and together with your staff, you will become more and more experienced in handling that way.

And, perhaps in the future, we should use these basic principles even for emergency situations. This is only a question of transposing the basic principles of structured day surgery concept in a more flexible way of working.

Conclusion

- Fast track surgery is performing surgery in an optimised way;
- The Day Surgery (DS) concept is organising planned surgical acts in a structured pathway, if possible, without overnight stay;
- Perioperative Medicine is the study of the medical acts allowing the two previous concepts.

Finally, we cannot perform day surgery without the use of fast track principles and the application of enhanced recovery methods. Everything that has to do with perioperative medicine is necessary to implement the day surgery concept.

The concept of Day Surgery developed because of the better knowledge of human nature. The concept of Day Surgery came along and is stimulated because of the lack of hospital beds and some practical and financial issues. The concept of Day Surgery follows the economic principles of focused factory and focuses in the first place on surgical acts to be performed without overnight stay.

In this sense the Day Surgery concept is renewing, but not without Fast track Surgery (FTS), Enhanced Recovery After Surgery (ERAS) and Perioperative Medicine.

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Intrathecal prilocaine, 2-chloroprocaine and bupivacaine for ambulatory abdominal wall herniorrhaphy: a prospective observational study

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Abstract

Objectives: Considering fast-track principles, an ideal spinal anesthetic should have minimal complications and above all fast recovery so reducing in-hospital stay.

Methods: Between 1/8/2015 and 1/1/2016, a total of 101 patients with an umbilical or unilateral inguinal hernia were enrolled in this observational study. 10.5mg bupivacaine (B-group), 40mg 2-chloroprocaine (C-group) or 60mg prilocaine (P-group), each with added sufentanil (2µg) was used as spinal anaesthetic. Full regression of sensory and motor block and time to independent micturition (>200ml) were defined as clinical endpoints.

Results: 33 patients were injected with bupivacaine (B-group), 33 patients with 2-chloroprocaine (C-group) and 35 patients with prilocaine (P-group). Pain during surgery was predominantly seen in the C and P-group (5 and 1 patient(s) with the need for general anaesthesia in 2 patients (1 in the C-group, 1 in the P-group). Mean time to full regression of sensory and motor block was 5,3; 2,8; 3,9 hours and 3,1; 1,8; 2,2 hours for respectively the B, C and P-group. Time to independent micturition (>200ml) was similar in all groups: 6,9 (B); 5,1 (C); 5,6 (P) hours. Only in the B-group, postoperative urinary retention with the need for catheterisation (4 patients) and overnight stay was encountered.

Conclusions: Bupivacaine has a rather slow recovery with a risk of urinary retention. 2-chloroprocaine has a faster motor and sensory block regression as compared to prilocaine.

Keywords: Ambulatory surgery, hernia, abdominal, umbilical, intrathecal, prilocaine, bupivacaine, 2-chloroprocaine, ambulation, discharge, fast-track.

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Introduction

Open inguinal and umbilical hernia repair are two of the most performed surgical interventions in day-care surgery. Fast-track surgery implies a short acting anesthesic with few side-effects.

Spinal anesthesia has proven to be a safe method to ensure adequate analgesia for patients undergoing elective open abdominal wall surgery. During many years, a variety of intrathecal products alongside a plethora of adjuvants have been evaluated. Three different types of spinal anesthetic products already used in routine care were compared for feasibility and efficiency: 2-chloroprocaïne (Ampres®, Nordic Pharma), bupivacaine (Marcaine®, AstraZeneca) and prilocaine (Tachipri®, Nordic Pharma).

Methods

We conducted a prospective five month observational study on patients undergoing day-care surgery for an umbilical or unilateral inguinal hernia. Local ethical committee approval (EC0G099 - AZ Sint Dimpna, Geel, Belgium – 8/2015) and individual written informed consent was obtained. Surgical procedures were performed by two surgeons (TL and TG). The hernia was diagnosed clinically and/or by ultrasonography. Patients were preoperatively informed about the details concerning surgery and anesthesiology. This study was registered retrospectively at ClinicalTrials.gov (NCT02813382).

All patients were hospitalized on the day of surgery following standard preoperative instructions. Spinal anesthesia was performed by six different anesthesiologists. Patients with contraindications for spinal anesthesia were excluded: INR (International Normalized Ratio) > 1.2, thrombocytopenia (<75.000/µl), symptomatic neurological disease and/or an allergy for local anesthetics.

Patient's baseline features were listed: gender, age, Body Mass Index (BMI), Anesthesiologists Physical Status classification (ASA classification), the patient's position at the moment of intrathecal injection (sitting up or in dorsolateral decubitus) and type and length of surgery. Open inguinal herniorrhaphy was performed following the Liechtenstein technique as described by Chastan [1,2]. For the treatment of an umbilical hernia, a polypropylene-ePTFE hernia patch (Ventralex™, BARD®) was used [3] .

Patients were injected with 10.5mg bupivacaine (B-group), 40.0mg of 2-chloroprocaïne (C-group) or 60.0mg prilocaine (P-group), each in combination with sufentanil (2.0µg). The choice of the product was based on the decision of the anesthesiologist.

All patients were administered 5mg of ephedrine and 0.2mg of glycopyrronium bromide IV after injection of the spinal anesthetic. A crystalloid solution was started at 200 ml/hr. Standard monitoring was used during the procedure: blood pressure monitoring, pulse oximetry and three lead electrocardiogram. Parameters were continuously recorded by a patient data management system (GE Ohmeda Health Care Aisys and Chipsoft). Hemodynamic anomalies were listed: hypotension (systolic pressure <75% of baseline value), bradycardia (pulse <60/min) and desaturation (SpO_2<92%).

The skin of the lower back was anesthetized with 3–5 ml of 1% lidocaine under aseptic conditions. Spinal anesthesia was performed at the L2-L3 interspace using a 27 G x 3 1/2 inch BD™ Whitacre needle pencil point needle. This procedure was performed sitting-

up or in dorsolateral decubitus (in inguinal hernia repair lying on the ipsilateral side when using prilocaine or bupivacaine and on the contralateral side when using 2-chloroprocaine). Patients in the sitting up position were instantly put in the dorsolateral position after the injection (side again depending on the product and type of surgery as described above). Regardless of these proceedings, all patients receiving 2-chloroprocaine were put in the reverse Trendelenburg position (approximately 20°) for 1–2 minutes immediately after infusion.

After injection, sensory and motor block assessment was performed and listed on predetermined time intervals: 1, 3, 30 minutes after infusion and from then on every 15 minutes until spontaneous voiding (>200ml) was achieved. Sensory block was evaluated by assessing the peak level dermatome (using the loss of thermoalgesia assessed by evaporation of ether starting at the L2 dermatome). Motor block was assessed using the Bromage scale.

During surgery, hypotension (systolic pressure <75% of baseline value) was treated with ephedrine and bradycardia with atropine and/or ephedrine. Patients experiencing desaturation (blood oxygen saturation <92%) received oxygen through a standard face mask starting at 2l/min. Intravenous (IV) fentanyl (25µg) was given as an escape drug. If insufficient analgesia was achieved (insufficient sensory block height), general anesthesia was initiated.

Postoperatively, all patients were transferred to the Post-Anesthesia Care Unit (PACU), where they received IV paracetamol (1g) and ketorolac (30mg). Postoperative nausea and vomiting (PONV) was treated with alizapride (50mg), if needed followed by ondansetron (5mg). After a minimum stay of 90 minutes, signs of regression of the motor block (Bromage scale) and normal hemodynamic parameters, patients were transferred to the day-care hospital for further recovery.

Full regression of sensory (defined as regression to the S2 dermatome) and motor block (Bromage 0) and time to independent micturition (>200ml) were defined as clinical endpoints. Pain experienced at the day-care hospital was managed with oral paracetamol (500mg) and ibuprofen (600mg), after determination of a Visual Analog Scale for Pain (VAS).

All data was analyzed using IBM SPSS statistical software version 23 and Microsoft Excel 2010. Comparison of continuous variables was performed using the F-test and posthoc analysis. Categorical variables were compared by means of a chi-square test. A p-value < 0.05 was considered statistically significant.

Results

A total of 101 patients were included. 33 patients were injected with bupivacaine (B-group), 33 patients with 2-chloroprocaine (C-group) and 35 patients with prilocaine (P-group). Mean age at surgery was 62.8 years (range 20.9 - 91.7) with a mean BMI of 26.3 kg/m² (range 17.9–39.4). 72 patients underwent unilateral open inguinal hernia repair and 29 umbilical hernia repair. ASA classification was ranked "1" for 93, "2" for 7 and "3" for 1 patient(s). Analysis of baseline demographic data did not show any significant differences between groups, besides from the ASA- classification (Table 1). Mean time

Table 1 Baseline demographic data (Mean + Range).

		B-group (n=33)		C-group (n=33)		P-group (n=35)		P-value
Patients (n)		33	32.7%	33	32.7%	35	34.7%	0.942
	male/female ratio	10.0		32.0		6.0		0.265
	age	67.2	(35.4 – 91.7)	57.9	(24.0 – 82.7)	63,4	(20.9 – 90.6)	0.053
	BMI	26.6	(17.9 – 39.4)	25.3	(18.7 – 30.1)	26.9	(20.3 – 38.6)	0.252
ASA*								
	1	27		33		33		0.020
	2	6		0		1		0.009
	3	0		0		1		0.386
	4	0		0		0		-
Position during spinal injection								
	Sitting up	1		6		2		0.069
	Lateral decubitus	32		27		33		0.069
Duration of surgery (min)		36	(14 – 63)	31	(14 – 48)	35	(12 – 56)	0.094
Type of surgery								
	inguinal hernia	25		22		25		0.717
	direct	13	52.0%	10	45.5%	10	40.0%	0.695
	indirect	15	60.0%	15	68.2%	19	76.0%	0.479
	combination	3	12.0%	3	13.6%	4	16.0%	0.919
umbilical hernia		8		11		10		0.717
	mesh	8	100%	10	90.9%	10	100%	0.429
	primary	0	0%	1	9.1%	0	0%	0.429

ASA: Anesthesiologists Physical Status classification

until spontaneous micturition was 6.9 ± 2.0 hours (B-group), 5.1 ± 1.9 hours (C-group) and 5.6 ± 1.3 hours (P-group). There was no significant difference between groups. Mean time until complete sensory recuperation was 5.3 ± 2.2 hours (B-group), 2.8 ± 1.6 hours (C-group) and 3.9 ± 2.0 hours (P-group). Mean time until complete motor regression was 3.1 ± 1.7 hours (B-group), 1.8 ± 0.8 hours (C-group) and 2.2 ± 0.8 hours (P-group). Both were significantly faster in the C-group (as compared to the P and B-group). Details concerning the regression of sensory and motor blocks are displayed in Table 2.

In the C-group, four patients (p=0.077) experienced significant pain during surgery which was successfully managed using IV fentanyl. Intraoperative hypotension was only encountered in the C and P-group (p=0.001), as was pain requiring conversion to general anesthesia (one patient in each group). Postoperative pain (VAS 4-6) was encountered significantly more in the C-group (p=0.041). Need for an overnight stay (due to prolonged PONV and/or urinary retention requiring indwelling catheter) was only seen in the B-group (P=0.042). Intra- and postoperative hemodynamic data, symptoms and need for analgesia are displayed in Table 3.

Discussion

In this study, a significantly faster regression of motor and sensory block was seen for intrathecal 40mg of 2-chloroprocaine (2-CP) as compared to 60mg of prilocaine, both with 2.0µg of added sufentanil. Time to independent micturition however, was comparable. Both products were ineffective requiring general anesthesia in one patient each.

Because of the recorded neurotoxicity when administered in large doses [4] and potential high incidence of transient neurological symptoms (TNS) [5], the use of 2-CP for spinal anesthesia was unpopular in the past. It was finally approved in Europe in 2013 [6] after extensive testing. In a study of over 4000 patients, Goldblum et al [7] described 5 possible cases of TNS and 1 regressive incomplete cauda equine syndrome. Valth et al [8] did research concerning the effects of added fentanyl (20µg) and concluded an average time to void of 104±7 min with a prolonged surgical block, but without significantly delaying discharge. Furthermore, a somewhat longer time to complete sensory and motor block regression was seen in comparison with other studies using plain 40mg 2-CP [9, 10, 11]. We recorded a significantly longer average time to independent micturition when using 40mg 2-CP ranging from 96 to 271min [12, 13]. In those studies however, a plain product was used (without added sufentanil). Unfortunately, few comparable articles studying the effects of added sufentanil are available at this time. Maes et al [14] recorded a time to complete motor block regression of 73 min (41–114 min) using 40mg of 2-CP with sufentanil (1µg) for caesarean sections (n=18). In literature, encountered intraoperative hypotension ranges from 4.5 to 54% [15, 16, 17].

Dahlgren et al [18] recorded a comparable sensory peak block height (T4 versus T3 in our study) when using 12.5mg of bupivacaine with 2.5µg of sufentanil in patients undergoing C-section. Furthermore, in this randomized, double-blind fashion study (n=20) they recorded a similar motor block regression (177min versus 168min in our study). In a randomized controlled clinical trial involving 90 patients undergoing lower limb surgery, Hassani et al [19] concluded that the use of added sufentanil (2.5µg) resulted in a longer complete and effective analgesia as compared to intrathecal fentanyl and placebo. Also, they did not notice any significant difference in motor block. Overall, postoperative urinary retention after intrathecal infusion of bupivacaine with added sufentanil is encountered in 2.7–40% of patients [20, 21].

2-CP is suggested to be used for ultra-short and short ambulatory surgery (up to 45min). Prilocaine should be suitable for somewhat longer surgical interventions [22]. Few studies regarding the use of intrathecal prilocaine with added sufentanil are currently available. In a randomized, clinical trial comparing the efficacy of 40 and 60 mg of hyperbaric versus 60 mg of plain 2% prilocaine, Camponovo et al [23] described a faster sensory block regression (163 min), faster spontaneous micturition (336 min) and slower motor block regression (157min to Bromage 0) in a younger population (47 years old on average) as compared to our results (using plain prilocaine). Akcaboy et al [24] also noticed a significantly higher incidence of intraoperative bradycardia and hypotension (23.3%) after prilocaine 50mg with 25 µg fentanyl in a male population (70 years old on average) undergoing TURP. Other authors confirmed these observations [25, 26].

Table 2 Post injection sensory and motor block clinical data (mean values and range).

	B-group (n=33)	C-group (n=33)	P-group (n=35)
Time to independent micturition (h)	6.9 (2.0-11.3)	5.1 (2.4-9.7)	5.6 (2.4-8.2)
In hospital time (h)	8.5 (4.0-10.9)	8.0 (4.2-10.8)	8.1 (5.2-9.4)
Time to complete sensory regression (h)	5.3 (1.7-9.2)	2.8 (1.0-8.1)	3.9 (1.3-9.3)
Time to complete motor regression (Bromage 0) (h)	3.1 (1.3-9.2)	1.8 (0.8-4.3)	2.2 (0.7-4.2)
Time from spinal anesthesia to ready-to-cut (min)	3.4 (1.0-19.0)	2.8 (1.0-15.0)	3.7 (1.0-22.0)
Time from spinal anesthesia to start of surgery (min)	11.1 (2.0-20.0)	10.8 (3.0-24.0)	11.5 (1.0-22.0)
Time to T6 (min)	8.1 (1.0-20.0)	12.1 (1.0-68.0)	10.8 (1.0-63.0)
Time to T10 (min)	2.8 (1.0-19.0)	1.5 (1.0-15.0)	3.1 (1.0-22.0)
Peak sensory level time to onset (min)	36.3 (1.0-70.0)	28.3 (1.2-69.0)	26.3 (1.0-67.0)
Peak sensory level (dermatome)	T3 (T1-T9)	T4 (T3-T9)	T5 (T2-T9)

*P-values are calculated between C-group and P-group.

**P-values show significant faster sensory and motor block recuperation in the C-group.

time to complete sensory recuperation was defined as complete regression to the S2 dermatome

Table 3 Intra- and postoperative hemodynamic data and clinical symptoms.

	B-group (n=33)		C-group (n=33)		P-group (n=35)		p-value
Intraoperative period							
Hypotension (systolic blood pressure ≤ 75% of baseline value)	0	0%	7	21.2%	12	34.3%	0.001
Bradycardia (pulse < 60bpm)	6	18.2%	4	12.1%	3	8.6%	0.491
Desaturation (SpO2 < 92%)	1	3.0%	5	15.2%	4	11.4%	0.240
Pain	1	3.0%	5	15.2%	1	2.9%	0.077
Pain requiring general anesthesia	0	0%	1	3.0%	1	2.9%	0.609
Nausea	2	6.1%	4	12.1%	4	11.4%	0.664
Postoperative period							
PONV*	2	6.1%	4	12.1%	4	11.4%	0.664
Pain	3	9.1%	7	21.2%	3	8.6%	0.218
VAS** (0-3)	3	9.1%	3	9.1%	3	8.6%	0.996
VAS** (4-6)	0	0%	3	9.1%	0	0%	0.041
VAS** (7-10)	0	0%	1	3.0%	0	0%	0.353
Postoperative urinary retention (requiring catheterization)	4	12.1%	0	0%	0	0%	0.014
Need for overnight stay	3	9.1%	0	0%	0	0%	0.042
Due to need for urinary catheterisation	2	6.1%	0	0%	0	0%	0.122
Due to prolonged PONV*	1	3.0%	0	0%	0	0%	0.353

*PONV = Postoperative Nausea and Vomiting (in the hospital)

**VAS = Visual Analogue Scale for Pain

Limitations of this study are obviously the non-randomization and small sample size in each group. Specifically for abdominal wall surgery, relatively few articles seem to exist concerning the efficacy of different products with added sufentanil.

To conclude we can state that in the setting of elective ambulatory abdominal wall surgery (open unilateral inguinal and umbilical hernia repair), bupivacaine offers long-time adequate analgesia but carries a rather high risk of postoperative urinary retention. 2-CP is associated with the fastest sensory and motor block regression, however one should be aware that some degree of intraoperative (refractory) pain is possible and conversion to general anesthesia might be needed. The latter remark together with a slightly higher incidence of hypotension also holds true for prilocaine.

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Short-stay Hospitalisation for Malignant Thyroid Surgery in a District General Hospital: Retrospective Analysis and Consecutive Series of 3882 Cases over a Five-Year Period

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Abstract

Objectives: To describe data from patients undergoing thyroid surgeries for malignant disease in a District General Hospital in Shanghai.

Methods: Discharge data were collected from January 2010 to December 2014 with a searching strategy based on diagnosis of malignant thyroid disease and patients undergoing thyroid surgery .

Results: During the study period, 3882 cases of thyroid cancer were performed with thyroidectomy, 10.25% of patients (398 cases) stayed less than 24 hours, 32.99% of patients (1281 cases) stayed less than48 hours, 56.75% stayed (2203 cases) more than 48 hours. Various factors that contribute to length of stay (LOS) of surgery were analysed, medical economic parameters (drug cost, medical disposable materials cost, and total cost) were also studied.

Conclusion: This is the largest series reporting of short-stay hospitalisation outcomes of malignant thyroid surgery from China. The duration of hospitalization of the malignant thyroid surgery should be determined in accordance with chronic general and/ or comorbid conditions, Tumor size and sides, surgery procedure, and complication. Short-stay hospitalization model for malignant thyroid surgery is safe, cost-effective, and highly agreeable for patients in China.

Keywords: Length of stay; Thyroidectomy; Neck dissection; Total Cost.

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This research was supported by grants from "The municipal hospital clinical optimization management project" Fund, Shanghai Hospital Development Center (No.SHDC2014609)
This paper was presented as an oral abstract at the 11th International Congress on Ambulatory Surgery in Barcelona and published in *Ambulatory Surgery* 2015;**21.3**:111.
All authors declare that they have neither financial relationship with the organization that sponsored the research nor conflict of interest regarding this manuscript.

Introduction

Day-case and Short-stay surgery treatment has well-documented advantages related to both the patient and hospital [1]. Short-stay thyroid surgery (SSHS, <24 h hospital stay) is becoming increasingly popular throughout the world to reduced hospital stay and cost efficiency [2,3].

To decrease expenditure without compromising the quality of patient care, during the last 10 years, short-stay benign thyroid surgery has been performed in our District General Hospital, Renji Hospital, School of Medicine, Shanghai Jiaotong University as safe and cost-effective.

In China, hospitalizing patients undergoing malignant thyroid surgery were traditionally observed for 48 h or longer, to safeguard against potentially catastrophic complications such as postoperative hemorrhage (with resultant airway compression), hypocalcaemia and recurrent laryngeal nerve injury. The introduction of a prospective payment system (T2A) has led Surgeons in Shanghai to participate in the financial management and to reduce overall costs in their day-to-day medical practice. We are also trying to reduce the length of stay (LOS) malignant thyroid surgery since 2010, which wasn't accepted by most surgeons in China.

With experienced hands, strict selection criteria, and follow-up, we confirmed that short-stay hospitalisation model for malignant thyroid surgery is safe, cost-effective, and highly agreeable in patients.

During the study period from January 2010 to December 2014 in Renji Hospital, School of Medicine, Shanghai Jiaotong University, the authors retrospectively reviewed the data of 3882 thyroid cancer patient thyroidectomies which stayed <24 hours, 24 hours≤ n<48 hours , ≥48 hours; To determine the feasibility, safety, and medical economic parameters (drug cost, and medical disposable materials cost, total cost).

Patients and Methods

From January 2010 to December 2014 in Renji Hospital, School of Medicine, Shanghai Jiaotong University, 3882 consecutive thyroid cancer patients who underwent thyroidectomy were reviewed retrospectively. Preoperative workup included physical examination, ECG ,thorax radiography and blood tests required for general anesthesia and associated pathologies (Decompensated heart failure, respiratory failure, anticoagulation or antiaggregant therapy, epilepsy, diabetes mellitus, nephropathy, hepatopathy) should be control to endure the operation and general anesthesia. All patients received preoperative evaluation of vocal cord mobility by means of indirect laryngoscopy or fibrolaryngoscopy, thyroid function tests (fT3, fT4, TSH), preoperative ultrasonography and neck CT scan. FNA of suspicious or dominant thyroid nodules were performed in selected patients. All patients signed informed consent before surgery. The pre-, intra-, and postoperative details were preserved in a dedicated

database and retrospective analysis of medical notes was undertaken for these 3882 patients over a 5-year period.

All patients and relatives received extensive written and verbal preoperative and postoperative teaching and clear information and explanations in the hospital, delivered by the multidisciplinary team of nurses, surgeons, and anesthesiologists. This included psychological support and explicit information about postoperative health consequences such as risks and benefits of the shortening of hospital stay, wound management, postoperative pain, and signs and symptoms associated with complications.

A multidisciplinary team consisting of a surgeon, anesthesiologist and endocrinologist and nurse determined whether the patient's stay in hospital could be reduced. A complete preoperative assessment was obtained from all patients in order to determine the eligibility of the reduction of LOS. Patient with severe anxiety, sleep apnea syndrome, deafness, defective vision, metal retardation, pregnancy, preoperative unilateral recurrent nerve palsy, chronic pain, morbid obesity, taking drugs that have an effect on coagulation (aspirin, warfarin and corticosteroids) can't be allowed to be discharged less than 48 hours.

According to the tumor size, sides, pathologic type, lymph node metastasis and stage, surgeon determine which the following procedure to perform: total, near total thyroidectomy, hemithyroidectomy+ isthmusectomy, level VI (Central neck LN) dissection, lateral neck dissection(level II-V).

Hemostasis was achieved by ultrasonic scissors (Harmonic, Johnson & Johnson, Cincinnati, Ohio, USA) Meticulous hemostasis was performed before skin closure. Suction drains were left selectively in the operative field and removed the next day. If the amount of bleeding during the operation is less than 20ml, no drains are placed.

Immediate postoperative surveillance is essential. Clinical signs of postoperative cervical hematoma (increase in neck volume or upper airway dyspnea), recurrent nerve palsy (voice alteration, dyspnea, difficulty swallowing liquids), or hypocalcemia (circumoral or extremity paraesthesiae, carpo-pedal spasm or tetany) must be observed carefully. Laryngeal examination and measurement of serum calcium or PTH levels can be proposed. Ideally, PTH should be measured 4h after the end of surgery in order to best predict the risk of postoperative hypocalcaemia, an argument used against early discharge.

During their scheduled rounds, nurses monitored vital parameters (breathing, blood pressure, pulse rate), drainage volume, wound status, phonation, and pain (evaluated by means of Visual Analogue scale).

The patients were able to contact the unit by direct phone number (24 hr/day). Discharged patients were asked to keep the team informed about any wound discomfort occurring at home. Patients were asked to report any complication in the neck, such as swallowing distress, fever, sore throat, or wound infection. Ambulatory center is responsible for the coordination of subsequent use of resources such as contacts with physicians, unplanned emergency department visits, or hospital readmissions.

Discharge may be also delayed because of the Patient's non-medical contra-indications: difficulties in communication (non-native speaking patients), a long and difficult journey between home and the surgical facility (long distance, urban traffic), absence of emergency transportation or familial or social isolation.

In order to shorten the hospital stay of the malignant thyroid surgery. patients must have no major comorbidities, sufficient preoperative education, a willing caregiver, a safe social setting for postoperative recovery, and proximity to a skilled care facility. Criteria for early discharge include ability to void and take adequate oral intake (PO), stable vital signs, no wound or airway problems, thorough postoperative assessment with attention to signs of hematoma or recurrent laryngeal nerve injury, adequate pain control, and an up sloping serum calcium curve, reliable social support [4].

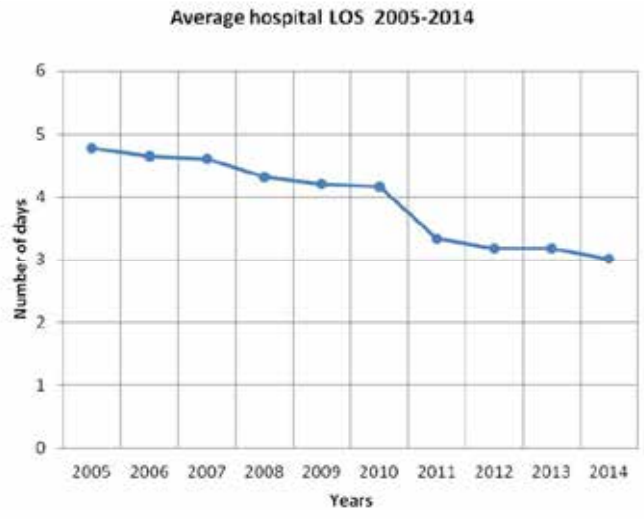
Statistical analysis was performed by χ^2 or Fisher's exact test to compare categorical variables, and t test was used to compare continuous variables between the three groups. All statistical analyses were performed by using SPSS version 19.0 (SPSS, Inc., Chicago, IL).

Results

1.1 Length of stay and grouping

A consecutive series of 3882 malignant thyroid surgery from January 2010 to December 2014 in Renj Hospital were retrospectively analyzed. There were 2850 female patients (73.4%) and 1032 male (26.6%), with a mean age of 46.49±12.29 years (ranging from 7 to 85 years). 10.25% of patients (398 cases, Group I) stayed less than 24 hours (overnight), 32.99% of patients (1281 cases, Group II) stayed between 24 hours and 48 hours, 56.75% stayed (2203 cases Group III) more than 48 hours. Mean hospital stay was 3.28 ± 1.94 days. Demographic characteristics of these patients with malignant thyroid carcinoma stayed in our hospital were shown in Table 1. The data demonstrated that 98.5% of Group I had no AHRQ chronic and/ or comorbid conditions compared with only 92.7% in Group II and 79.3% in Group III. ($p<0.001$). Figure 1 shows that the average hospital LOS of the malignant thyroid surgery patients from 2005 to 2014.

Figure 1 The average hospital length of stay of the malignant thyroid surgery patients from 2005 to 2014.



1.2 Tumor size and Tumor sides

Table 2 shows tumour size and tumour sides of these patients with malignant thyroid carcinoma. We found that the larger the neoplasm, the longer the length of hospital stay, For patients with bilateral neoplasm, the length of hospital stay was significantly prolonged .

1.3 Malignant thyroid surgery:thyroidectomy /neck dissection

Frozen section (FS) is the principal examination guiding surgical strategy. The duration in hospital is directly related to the type of the thyroidectomy (hemithyroidectomy + isthmusectomy, near total, or total) and the type of neck dissection (Central neck LN dissection, lateral + Central neck dissection)

Table 1 Demographic characteristics of patients with malignant thyroid carcinoma.

Stay in hospital	Group I	Group II	Group III		χ^2	p Value
Age	Mean age (years, SD)	46.39 ±11.36	45.88 ±12.04	46.83 ±12.54	1.82	0.403
	< 45years (n,%)	163 (40.9%)	556 (43.4%)	907 (41.2%)		
	≥ 45years (n,%)	235 (59.1%)	725 (56.6%)	1296 (58.8%)		
Gender	Male (n,%)	92 (23.1%)	347 (27.1%)	596 (27.0%)	2.85	0.240
	Female (n,%)	306 (76.9%)	934 (72.9%)	1607 (72.9%)		
Chronic/comorbid conditions		10 (2.5%)	93 (7.3%)	456 (20.7%)	169.5	1.54E-37*
Total(n)		398	1281	2203		

Group I: stay in hospital <24 hours;Group II: stay in hospital<48 hours; Group III:stay in hospital ≥ 48 hours (* p<0.05)
Chronic/comorbid conditions: central obesity, CAD cardiovascular disease, HTN hypertension, DM diabetes mellitus, DL dyslipidaemia, CKD chronic kidney disease, COPD chronic obstructive pulmonary disease, anaemia

Table 2 Tumour size and sides of these patients with malignant thyroid carcinoma.

Stay in hospital		Group I	Group II	Group III	χ^2	P Value
nodule(cm)	<1(n,%)	338(84.9%)	1033(80.6%)	1342(60.9%)	44.5	5.75E-08*
	1≤n<2(n,%)	51(12.8%)	192(15.0%)	521(23.6%)		
	2≤n<4(n,%)	9(2.3%)	49(3.8%)	259(11.8%)		
	≥4(n,%)	0	7(3.7%)	81(3.7%)		
bilateral		26(6.5%)	112(8.7%)	499(22.7%)	145.7	2.23E-32*
unilateral		372(93.5%)	1169(91.3%)	1704(77.3%)		
Total		398	1281	2203		

Nodule size: Group I vs Group II :X^2 =5.99,P=0.11;Group II vs Group III: X^2 =164.9,P=1.54E-35
Bilateral: Group I vs Group II : X^2 =1.97,P=0.16 Group II vs Group III: X^2 =108.3,P=2.26E-25
(* p<0.05)

1.4 Complication for malignant thyroid surgery

Complications were analyzed by discharge status and extent of thyroid surgery. (Table 3). There were significantly more complications in the group III vs group II and group I. Four patients with unilateral recurrent nerve palsy were staying in hospital less than 48 hours.

Postoperative vocal cords status was assessed for each patient by indirect laryngoscopy performed by an ENT specialist. Unilateral vocal cord palsy was not considered a contraindication to discharge and patients were advised to check vocal cord mobility after 2 weeks. Patients with bilateral cord palsy were not discharged, and their hospitalization was immediately converted to inpatient treatment in the same department. Laryngeal nerve injury was defined permanent if it persisted 12 months after surgery.

The reference range of serum calcium levels was 8.0–10 mg/dl. Temporary hypocalcaemia was defined as calcaemia < 8.0 mg/dl occurring after surgery and recovering within 6 months. The serum calcium level was measured in all patients undergone total thyroidectomy on the first postoperative day before discharge. Patients were asked to repeat the blood sample at day 2, and once a week for 3 weeks after the operation. Therapy was prolonged as long as necessary and progressively reduced up to complete retrieval depending on calcium levels registered at scheduled blood tests.

In the group I, 1 patient was readmitted within one week due to surgical site infection, 4 patients due to the cervical hematoma after their surgery. In the group II, 2 patients were readmitted within one

Table 3 Complications for malignant thyroid surgery (number and percentage).

Complication	Group I	Group II	Group III
Haematoma/haemorrhage	0	0	56 (2.54%)
Unilateral recurrent nerve palsy	0	4 (0.31%)	45 (2.04%)
Bilateral recurrent nerve palsy	0	0	3 (0.14%)
Acute respiratory distress	0	0	5 (0.23%)
Hypocalcaemia	0	0	22 (1.0%)
Surgical site infection	0	0	12 (0.54%)
Deep venous thrombosis pulmonary embolism	0	0	1 (0.05%)
Chyle leaks	0	0	1 (0.05%)
Patients readmitted within one week due to complications of their surgery	5 (1.26%)	11 (0.86%)	9 (0.41%)
Total	398	1281	2203

Table 5 Costs for malignant thyroid surgery (Yuan).

	Group I	Group II	Group III	Group I vs Group II		Group II vs Group III	
				t	P Value	t	P Value
Total costs	10330.4 ± 1763.9	11353.6 ± 2354.7	12267.1 ± 3819.6	27.1	<0.001	48.8	<0.001
Drug costs	1820.6 ± 753.9	2188.3 ± 1233.9	2242.1 ± 1800.2	57.9	<0.001	11.9	<0.001
Medical consumables costs	752.2 ± 614.6	762.1 ± 1295.5	730.4 ± 1101.0	2.6	0.164	0.008	0.775

week due to surgical site infection, 7 patients due to the cervical hematoma, 2 patients due to the hypocalcaemia. In the group III, 4 patients were readmitted within one week due to surgical site infection, 5 patients due to the cervical hematoma after surgery.

1.5 Cost

Total cost was also examined for the overall groups (Table 5). When taking into account all patient procedures, the total mean costs were 10330.4±1763.9Yuan ($1475.8±252.0, the yuan-dollar exchange rate of 7 yuan per U.S. dollar) in group I, 11353.6±2354.7 Yuan ($1621.9±336.4) in group II, 12267.1±3819.6Yuan ($1752.4±545.7) respectively (P<0.001) (Figure2). Total costs were significantly reduced for patients stayed less than 24 hours regardless of surgical procedure.

The drug mean costs were 1820.6±753.9Yuan ($260.1±107.7,) in group I, 2188.3±1233.9Yuan ($312.6±176.3) in group II, 2242.1±1800.2Yuan ($320.3±257.2) respectively (P<0.001) (Figure 3). Total drug were also significantly less expensive for patients stayed less than 24 hours regardless of surgical procedure.

The medical consumables mean costs were 752.2±614.6Yuan ($107.5±87.8,) in group I, 762.1±1295.5Yuan ($108.9±185.1) in group II, 730.4±1101.0Yuan ($104.3±157.3) respectively (P<0.05) (Figure 4). There was no significant difference in the medical consumables costs among these three groups.

Figure 2 Total cost for malignant thyroid surgery.

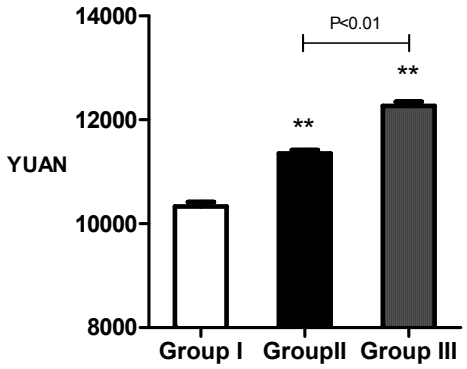


Figure 3 Drug costs for malignant thyroid surgery.

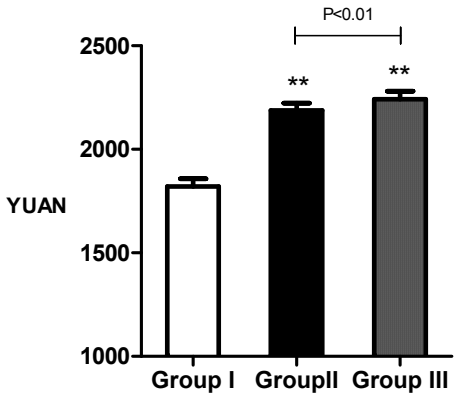
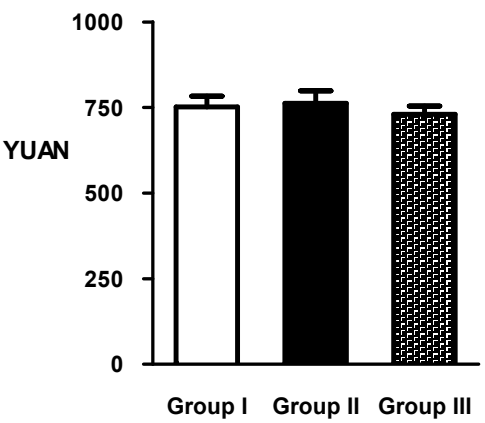


Figure 4 : Medical consumable costs for malignant thyroid surgery.



Discussion

In 1986, Steckler was the first to report on the feasibility of outpatient thyroid surgery, especially for benign thyroid surgery, concluding that it was both safe and cost effective [5]. The incidence of malignant thyroid disorders has been increasing sharply for many years in several countries, including China. According to data from the American Cancer Society, the number of new cases of differentiated thyroid carcinoma has been increasing in the last decades [6].

However, the reduction of the LOS of malignant thyroid surgery remains far from unanimous. Those who argue against the routine short stay malignant thyroid surgery, while aware of the potential hospital cost savings, maintain that this should not be at the expense of patient safety.

So the postoperative complications are the major causes for delayed discharge in our data, Patients discharged from hospital within 48 hours had no serious complications. 4 patients with unilateral recurrent nerve palsy in Group II, were also discharged earlier with the consent of these patients. Postoperative death during thyroid surgery is now rare or even unrecorded. Complications of malignant thyroid surgery are well described and including life threatening hypocalcaemia, expanding neck hematoma, and bilateral recurrent laryngeal nerve injury with potential for airway obstruction.

Technique advances in hemostasis, smaller incisions, improved

anesthesia, and rapid intraoperative parathyroid hormone assays have improved the safety and effectiveness of thyroid procedures [7,8]. But severe complications, whenever they arise, should of course delay patient discharge if ambulatory management had been planned.

The possibility of hematoma formation remains one of the major reasons for keeping patients overnight after surgery. Postoperative haemorrhage is the main concern for any thyroid surgeon, having the propensity to lead to rapid airway compromise, hypoxia and death. The majority of the postoperative bleeding (72.7 %) occurs in the first 6 hours after thyroidectomy, whereas the rest (27.3 %) developed between 6 to 24 hours [9]. Drains do not reduce the risk from this complication, but they can prevent acute airway compression, thus allowing prompt surgical intervention [10]. We found that the majority of hematomas occurred within the first 6 h after thyroidectomy requiring re-exploration. Incomplete closure of the lower strap muscles would allow any bleeding to be detected extremely early in the postoperative period as blood could easily decompress into the subcutaneous space. This would mean that significantly more bleeding would be required to cause tracheal compression [11]. It is now almost unanimously agreed that incomplete closure, or interrupted closure of the strap muscles affords significant benefits in the early detection of postoperative bleeding New devices for hemostasis and dissection proved to be safe and secure, reducing intraoperative and postoperative bleeding [12]. We initially inserted a drain into the paratracheal space to minimise the risks of haemorrhage. Currently the drain was placed only in complicated or in patients with significant dead space. Careful patient selection, careful observation of patients in the recovery room and early aggressive management of any apparent neck swellings may be the way to manage severe bleeding.

Postoperative hypocalcaemia remains a common complication following thyroid surgery. This is likely to preclude early discharge, and is thought to develop as a result of several factors including parathyroid devascularisation, injury, unintentional removal and 'stunning' from dissection [13]. Unlike haemorrhage or recurrent laryngeal nerve damage which can often be identified at surgery or early in the postoperative period, symptomatic hypocalcaemia can take much longer to manifest. Most cases of postoperative hypocalcaemia occur within 72 hr of surgery, and most develop signs more rapidly. There has been much interest about the use of intact parathyroid hormone (iPTH) to better predict hypocalcaemia after thyroidectomy. Recent studies reveled that normal postoperative PTH levels accurately predict normocalcaemia after total or complete thyroidectomy. In particular, PTH levels should id Extensive verbal communication and patient education regarding symptoms of hypocalcaemia, and prescribes postoperative calcium supplements to patients should be performed (difficult to understand). Studies have validated the role of measurement of parathyroid hormone levels (alone or in conjunction with corrected calcium levels) in patients undergone thyroid surgery and showed that this could be used as an accurate predictor of postoperative hypocalcaemia and thus help predict which patients are likely to be candidates for early discharge [14,15].

In order to avoid the injury to recurrent laryngeal nerve, one must employ meticulous techniques to identify this nerve with possible considerable anatomic variation. A strategy that can reduce the risk of recurrent laryngeal nerve injury is intraoperative electrical nerve stimulation of the surgical field in addition to visual control [16]. The consequences of bilateral recurrent nerve palsy are so severe that no surgeon will ignore it, once the hoarseness and dyspnea are simultaneously found. The symptoms of unilateral recurrent nerve palsy are relatively benign, which will not affect patients' earlier discharge.

Other factors such as: wound infection (WI) has a reported incidence of from 0.1% to 2%. There is no specific perioperative risk factor foreshadowed the development of WI; the definition of a high-risk population for this life-threatening complication remains obscure. Thyroid surgery is considered a "clean" procedure, and antibiotic prophylaxis (AP) is not indicated. The use of AP has not been shown to affect the incidence of WI. Infection occurs as a result of a breakdown in the sterile technique, and the most likely organisms are Staphylococcus Aureus and other skin contaminants. In fact, no WI usually presents within 3 days of initial operation [17]. In our data, WI is one of the main cause of unanticipated hospital readmission within one week after the surgery.

Postoperative pain is the main cause of delayed discharge. Severe postoperative pain also causes extreme discomfort and can prevent sleep, thus contributing to postoperative fatigue, limiting mobility at home, and delaying the return to normal activities. Pain following thyroidectomy results from wound cervicotomy, intraoperative cervical hyperextension that causes postoperative muscular cervicalgia, and laryngeal discomfort caused by frequent tracheal stimulation and movements of the endotracheal tube during surgical manipulation. Adequate postoperative analgesia is a prerequisite for successful ambulatory surgery. Estimates of the number of patients who suffer pain following day surgery are as high as 30–50% [18]. At present there is no randomized trial that has studied postoperative pain in detail after ambulatory thyroid surgery to understand the individual patient experience of pain, effective pain management, and the types and modes of action of various analgesics available to the ambulatory population as local, general, or regional anesthesia19. Optimal postoperative pain control for ambulatory surgery should be effective and safe, produce minimal side effects, facilitate recovery and be easily managed by patients at home. The role of opioids in day-case surgery is controversial because of their well-known side effects, especially nausea and vomiting, which can be deleterious after neck surgery. Paracetamol is the most commonly used analgesic worldwide because it is effective, cheap and safe [18,19].

In our data, in addition to surgical complications there are some other factors associated with LOS of malignant thyroid surgery. Chronic/comorbid conditions or diseases is associated with longer hospital stays for all the patients undergoing operation with malignant thyroid surgery being no exception. The tumour size of 84.9% patients in Group I is less than 1cm, no patient with tumour size larger than 4cm stayed in hospital less than 24 hours. The tumour size distribution of the three groups are significantly different; the smaller the tumour size, the shorter the LOS of malignant thyroid surgery patients. 92% of patients with a tumour larger than 4cm stayed in hospital more than 48 hours. The LOS of the patients with bilateral tumour was significant longer than those patients with unilateral tumour. In fact, the tumour size and the sides are associated with the procedure of the malignant thyroid surgery. In China, a tumour size less than 1cm is not usually recommended for total thyroidectomy and preventive lateral neck dissection, unless there is evidence of lateral neck lymph node involvement. Central neck lymph nodes dissection is a routine procedure for malignant thyroid operations, unless the patients or their families refuse it. The larger the scope of operation, the greater the risk of the postoperative complication and the longer the LOS of the malignant thyroid surgery, which has been confirmed in Table 4.

In our data, 10.25% patient in Group I (stayed less than 24 hours) was not high, the proportion of the patients in Group II (32.99%) was considerably large. The community recovery system was fairly undeveloped, the patients had reason to worry about their safety after discharge. A small number of patients suggested an excuse for refusing the earlier discharge: postoperative pain, weakness, dysphagia, etc. We believed that the proportion of malignant thyroid surgery stay in

Table 4 Malignant thyroid surgery: thyroidectomy /neck dissection.

Stay in hospital		Group I	Group II	Group III	x^2	P Value
Operation	Total thyroidectomy(n,%)	67 (16.8%)	285 (22.2%)	1130 (51.3%)		
	Near total thyroidectomy(n,%)	89 (22.3%)	416 (32.5%)	621 (28.2%)		
	Hemithyroidectomy + isthmusectomy(n,%)	242 (60.8%)	580 (45.3%)	452 (20.5%)		
Neck dissection	Central neck LN dissection (level VI)(n,%)	333 (83.7%)	1091 (85.2%)	1897 (86.1%)	1.85	0.396594317
	lateral+ Central neck LN dissection (level II-V +VI)(n,%)	0 (%)	16 (1.3%)	98 (4.5%)	42.51	5.88691E-10
Total		398	1281	2203		

Thyroidectomy:
Group I vs Group II :X^2 =29.5,P=3.88E-07 ;Group II vs Group III: X^2 = 340.8,P=9.47E-75

Neck dissection:
level VI(Central neck LN dissection):X^2 = 1.84,P= 0.396 ;
lateral neck dissection(level II-V): X^2 = 42.5,P= 5.89E-10(Group II vs Group III)

hospital less than 24hours will raise gradually with the development of medical system reform and the conversion of people's traditional concepts in the future.

In the hospital total cost mainly consists of three parts; procedure cost, drug costs, and medical consumables costs. Other expenses are less such as bed fee: 40 Yuan ($5.7) per day, and nursing care fee: 10 Yuan ($1.4) per day. When looking at total mean costs and drug cost, a clear trend to reduce costs is observed in group I compared with group II and group III. In United States 49936 patient thyroidectomies from the first quarter of 2009 to the second quarter of 2013 were collected in the University Health System Consortium (UHC) data. The overall mean cost of thyroidectomy patient was $5617 [20], which is likely to be 3 to 4 times as much as that of our malignant thyroid surgery. The duration of hospitalization is an important determinant of hospital costs. Ambulatory thyroidectomy should allow savings of 15 to 30% of the costs of hospitalization. In our data the group I allow about savings of 18% of the cost of hospitalization.

Conclusion

Short-stay surgery treatment has well-documented advantages related to the patient, hospital and government, to reach the result of co-win. Short-stay thyroid surgery requires clear and rigorous preoperative selection, discharge criteria and a multidisciplinary team with adequate professional structures and meticulous organization. An efficient structural organization is necessary to control the complication and conversion rates of the traditional hospitalization. According to our data, malignant thyroid surgery can be discharged less than 48h safely and effectively in properly selected patients in China.

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Early Outpatient Pain scores in Hip and Knee Arthroplasty. Could these be early predictors of painful joint replacements?

Asif Mahmood, Lauren Barklie, Oliver Pearce

Abstract

Total Hip (THR) and knee replacements (TKR) are now very common procedures performed in Orthopaedics with 150,000 performed per year in the UK according to the National Joint Registry. We know that some joints remain permanently painful even after replacements. It is well known that up to 20% of total knee replacements and 10% of total hip replacements remain painful even beyond 1 year post-implantation, the reasons for this are unclear.

Little is known about the mid-term pain levels after discharge from hospital to the community, nor whether this is predictive of ongoing pain later. The aim of this study was to tabulate the pain scores daily for the 1st 6 weeks post-surgery using Visual Analogue Score (VAS) three times a day. Functional outcomes were assessed using Oxford Knee Score (OKS) or Oxford Hip Score (OHS). This will provide a baseline in the literature for this period from which further studies can build.

A total of 80 patients undergoing THR or TKR were studied at Milton Keynes University Hospital. There were 40 hips and 40 knees. A total of 48 females and 32 males were studied. In THR group there were 21 females and 19 males, and the mean age was 67.27 years. In the TKR group there were 27 female and 13 male and mean age was 68.08 years. At the end of 6 weeks; the mean Oxford Hip Score was 31.33 while mean Oxford Knee Score 31.37. The Visual Analogue pain Score (VAS) was high in the first two weeks but at 6 weeks dropped down to slightly above 1. Our study demonstrates a linear reduction in pain scores on the VAS scale over the six week period for both hips and knees. Our study also shows diurnal variation of post-operative pain in both THA and TKA groups (with pain highest in the mornings and evenings and lowest at midday). Further studies taking cohorts out to 1 year and comparing early to late pain scores (1 year plus) are needed to see if those going on to have long term pain can be predicted early, and potentially alter their management positively.

As lengths of stay approach 1 day internationally, joint replacement is now considered suitable for ambulatory care. It becomes even more important to have a handle on pain levels once discharged into the community.

Keywords: : Pain, Study, Total Hip Replacement/arthroplasty, Total Knee replacement/arthroplasty.

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Introduction

Today, over 80,000 Total Hip Replacements are performed in England and Wales every year [1], and approximately 70,000 total knee replacements are performed per annum in England [2]. Much is known about the eventual long-term outcomes, and the period of inpatient hospitalisation but little is known about the period between discharge from hospital and time of first review in outpatients (usually 6 weeks) with regard to the patient experience, analgesia use and pain levels. However, it is known that some 20–25% of total knee replacements remain painful even after 1 year post implantation, the reasons for this are unclear, but this is a consistent problem internationally. There is less of a long term pain problem with hip replacements than with knees. Again the reason for this scientifically speaking is not clear.

The gap in our knowledge is exactly what goes on in the six weeks following surgery between being discharged from hospital and seeing the consultant again in the outpatient department, and whether factors during this early recovery influence long term outcome. Knee replacements remain sore for a number of weeks post-surgery, and patients are prescribed analgesia to take as required, and have appointments with a physiotherapist to help with ongoing rehabilitation.

The aim of this study was to tabulate the pain scores daily for the 1st six weeks post surgery, and to have once per week Patient Reported Outcome Measures (PROMS) in the form of OHS (Oxford Hip Score) or OKS (Oxford Knee Score). In this sense, this is an observational study. The secondary aim is to follow these patients up at 6 months and 1 year in the research physiotherapy PROMS clinics and to investigate if those who are struggling at 1 year would have been predictable based on their early pain scores or analgesia use or OHS and OKS in the 1st 6 weeks.

Methods

This is an observational study carried out in Trauma and Orthopaedics department of Milton Keynes University Hospital, United Kingdom. A total of 80 patients were studied, 40 underwent Total Hip Replacement and 40 who underwent total Knee Replacement between 2014 and 2016. The aim of this study is to tabulate the pain scores daily for the 1st 6 weeks post-surgery, and to have once per week Patient Reported Outcome Measures (PROMS) in the form of OHS or OKS.

Inclusion Criteria:

1) Patients undergoing Primary Total Hip and Total knee replacement.
2) Patients who are prepared to fill the proforma questionnaires post discharge.

Exclusion Criteria:

1) Patients undergoing revision hip or knee replacements.
2) Patients also having other body pains like, back pain or hip pain (as these influence the OHS or OKS).
3) Patients who are confused or having mental health issues.

Patients were made aware of the study before the surgery and verbal consent taken. Patients were provided with an Information Booklet clearly mentioning the objectives of the study.

The booklets contain a grid for Visual Analogue Scores (3 times / day), Oxford Knee / Hip score proforma and column for documenting daily analgesia use. They were provided with a self-addressed stamped envelope for returning the booklet or they handed back to the operating surgeon in clinic at their six week follow-up.

Results

80 patients were studied (40 hips, 40 knees). There were 48 females and 32 males. In the total hip replacement group there were 21 females and 19 males, mean age was 67.27. In the total knee replacement group there were 27 females and 13 males, mean age was 68.08 years. Mean overall Oxford Hip Score was 31.33 while mean Oxford Knee Score 31.37 for both hip and knee groups combined. The graphs below (Figures 1 to 4) show the VAS for the various subgroups analysed.

Discussion

The pain levels of patients post discharge from hospital after hip or knee arthroplasty have not been studied in the literature. Nor whether the outliers (with high pain scores) during this period go on to be those same patients beyond 1 year who have ongoing problems of a painful arthroplasty.

In our study we found that in the 1st postoperative week the combined mean VAS is 4.7/10, higher for the knees than for the hips. The VAS falls in a linear fashion continually from 1st to 6th week where it is approximately 1/10. There are some patients in the TKR and THR group in which pain remained as high as 4 in the end of six weeks. These outliers are the patients, in particular, that need to be followed up at six months and one years time, to see if they remain painful then, and hence could have been predicted at this earlier stage. If this does turn out to be the case; whether an early intervention in these patients could treat their pain early, and as a result, in the long term. For example with increased analgesia or increased rehab with physio or group therapy.

We also found a diurnal variation of post-operative pain in both THR and TKR groups (higher in the mornings and evenings, with a low point around midday). This has not been reported before. Post-operative pain in THA group is greater in the evening in the first week followed by morning in the second week. In 3rd, 4th and 6th week; morning pain is greater while in the 5th week evening pain is greater. The cause of this diurnal variation is not known. This information can be useful for the purposes of the timings of post discharge analgesia, ie stronger analgesics or higher doses for the morning and evening doses.

Our study is relatively small, only 80 patients were studied but even among these; there 4 patients (8%) who remained painful with VAS of 4 or above at 6 weeks post surgery. 3 were from the TKR group and 1 from THR group who had VAS of 4 or above (moderate pain). It is possible that they will remain painful throughout. But equally

Figure 1 Mean visual analogue scores by of day time after total hip replacement.

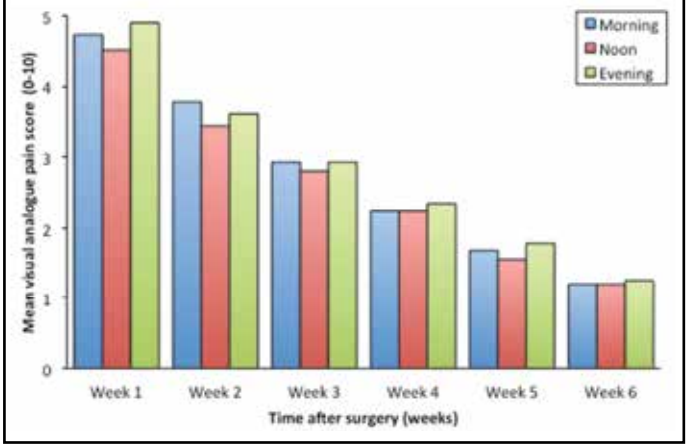


Figure 2 Mean visual analogue scores by time of day after total knee replacement.

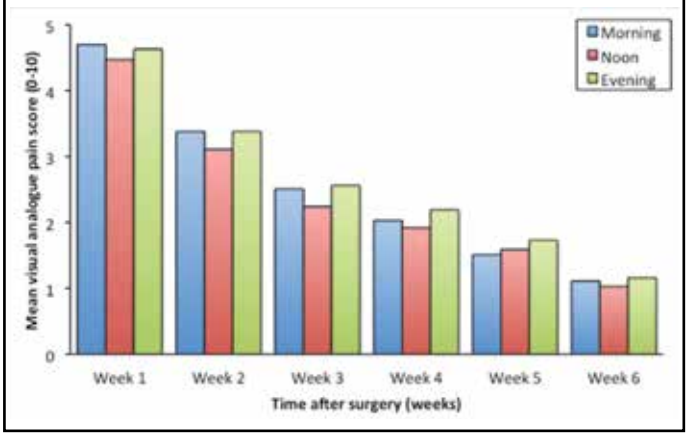


Figure 3 Average pain after hip replacement surgery.

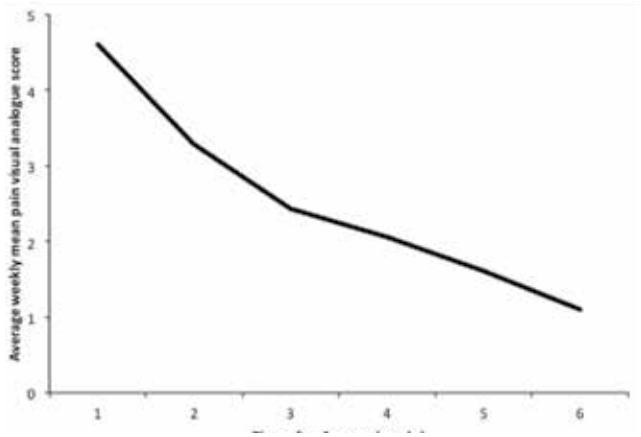
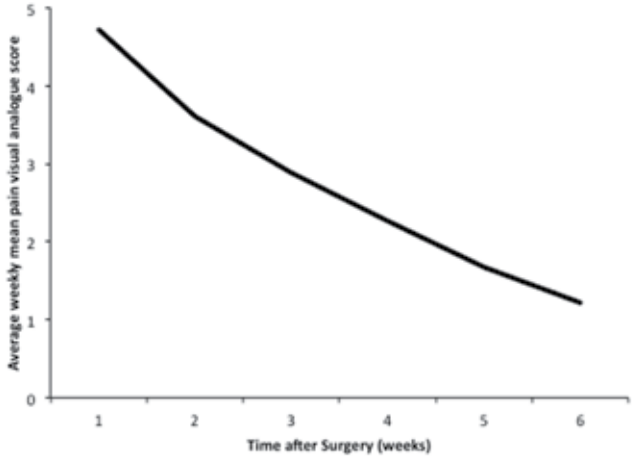


Figure 4 Average pain after knee replacement surgery.



possible, that their pain will settle down with time. This remains to be seen.

The reported estimates of the prevalence of post-operative pain after joint replacement vary, but are in the region of 7% to 20% of TKR patients3-6 and 2% to 8% of THR patients[7,8]. Therefore, although joint replacement is successful at providing pain relief for many patients, there is a proportion of patients who experience a poor outcome after surgery. And this cohort is the subject of many investigations, this one included.

In the literature there are some studies that show that a significant proportion of joint replacements remain painful in the early post-operative period. Chan and colleagues showed this in total knee replacements. In their study more than half of the participants had significant pain during the first 2 weeks at home. The majority of them had frequent pain, occurring during day with daily activities and interfering with their sleep despite almost 70% of the participants taking at least one opioid [9]. Bradley et al showed that cultural differences and ethnicity might have influenced pain responses, pain reporting and coping preferences between the Australian and Singapore cohorts [10].

Liu and colleagues[11] published a multi-centre cross-sectional study in 2012 to identify preoperative risk factors for moderate to severe pain after total hip and knee replacements. . They found that Moderate to severe pain was reported by 20% at rest and 33% with activity. Predictors for pain at rest were female gender, younger age, increased BMI, TKR vs. THR, increased severity of preoperative pain at the surgical site, preoperative use of opioids, and general anaesthesia, preoperative use of anticonvulsants, and anti-depressants, and prior surgery at the surgical site.

Finally persistent pain in a hip or knee replacements is not uncommon. Patients need to be informed of this prior to committing to their surgery. This aids informed consent. And may promote greater engagement with pre-operative optimisation and post-operative rehabilitation programmes.

With Rapid Recovery Programmes and Enhanced Recovery Programmes (also termed Fast Track Surgery), length of stay times are approaching 1 day. This is bringing joint replacement surgery in to the ambulatory care setting. It is clearly increasingly important to elucidate patient pain scores on discharge after these painful procedures.

In summary, in our study we found that the prevalence of persistent pain after TKR and THR is about 8% at 6 weeks after surgery. It is more in the TKR group as compared to THR group. There is also diurnal variation of post-operative pain in both THR and TKR groups.

Conclusion

The strengths of our study is that we used standard, validated and simple scoring systems to evaluate the postoperative pain, with this being the first report with detailed pain scores for this 6 week post-operative period. This study shows that some patients that have high pain scores (outliers), these are potentially the most interesting patients that need to be followed up at the one year mark. The whole cohort needs close attention out to 1 year, as if our figures for painful arthroplasty normalise to those in the literature, then our 6% will rise to 20%, and those 14% difference must therefore not have been outliers in the 1st 6 weeks. This remains to be seen.

An obvious weakness is the small sample size. Greater numbers would be necessary in future studies for statistical significance. The long term aim of this data is to look for early predictors of patients who will go on to suffer long term pain, with a view to be able to intervene early to prevent this.

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