

Original Article

Performing Screw Fixation for Femoral Neck Fractures under Local Anaesthesia 使用局部麻醉方法對沒有移位的股骨頸骨折進行螺釘內固定手術

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ABSTRACT

Background: Many patients who suffer from hip fractures have multiple medical comorbidities and there are risks when undergoing spinal or general anaesthesia. In fact, screw fixation can be performed under local anaesthesia infiltration for undisplaced femoral neck fracture, thus enabling patients for early mobilisation and rehabilitation.

Methods: Ten patients had screw fixation performed under local anaesthesia. Parameters including pain tolerability, operation time, time to mobilisation after operation, hospital stay, and surgical outcomes were measured.

Results: All 10 patients were able to complete the operation under local anaesthesia with minimal pain during the intraoperative period. No extra sedation, any form of intraoperative analgesia, or conversion to other form of anaesthesia was needed. No local wound or implant-related complication was detected in the early postoperative period. An average of 23.1 months (range: 17–28 months) follow-up showed all fractures had healed without any implant-related complications or avascular necrosis of the femoral head.

Conclusion: Screw fixation can be performed safely under local anaesthesia in selected patients who have high-risk of spinal or general anaesthesia in order to accelerate their rehabilitation.

中文摘要

背景：許多患有股骨頸骨折的病人有多種內科併存疾病。當中他們接受脊髓或全身麻醉的風險也相當高。事實上，螺絲固定手術可在局部麻醉下進行，讓患者得到最早的活動和復康。

方法：十位病人使用了局部麻醉方法進行螺釘內固定手術。研究參數包括了手術痛楚的耐受性，手術時間，術後的活動能力，住院時間以及手術結果進行了分析。

結果：所有十位病人都能夠以極微小的痛楚去完成局部麻醉方法的螺釘內固定手術。手術後初期並沒有任何傷口或螺釘相關的併發症。平均覆診跟進時間為23(17–28)個月，所有骨折皆能癒合，沒有植入物相關的併發症，股骨頭也沒有缺血性壞死。

結論：在一些病人因為脊髓或全身麻醉會出現高風險時，可以利用局部麻醉方法安全地進行螺釘內固定手術，從而加快病人的康復進度。

Introduction

Most undisplaced femoral neck fractures require operative fixation. Stable fracture fixation helps to control pain, allows patients to mobilise earlier, and prevents the risk of prolonged immobilisation. However, many patients who suffer from hip fractures have multiple

medical comorbidities that often require time to be optimised before they are fit for spinal or general anaesthesia. In fact, stable screw fixation can be performed with two parallel screws through a small surgical incision¹ under local anaesthesia. This procedure is particularly suitable for those who are medically unwell.²

The purpose of our study was to evaluate the feasibility of performing screw fixation for undisplaced femoral neck fracture under local anaesthesia. Other modes of anaesthesia for femoral neck operation are also reviewed.^{3–5}

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Table 1
Patients' demographic data

| Patient no. | Sex | Age (y) | ASA grade | Premorbid functional status | MMSE score | Operation time (min) | Wound size (cm) | Postop d 1/d 7 VAS pain score | Postop mobilisation (d) | Total Follow-up (mo) |
|-------------|-----|---------|-----------|-----------------------------|------------|----------------------|-----------------|-------------------------------|-------------------------|----------------------|
| 1 | M | 71 | 4 | Walk with quadripod indoor | 24 | 60 | 2 | 2/1 | 9 | 21 |
| 2 | M | 82 | 3 | Walk with stick outdoor | 21 | 46 | 1.5 | 8/1 | 3 | 8 |
| 3 | F | 82 | 1 | Walk unaided outdoor | 25 | 35 | 1 | 6/3 | 2 | 24 |
| 4 | F | 85 | 2 | Walk unaided indoor | 22 | 30 | 1 | 4/3 | 1 | 28 |
| 5 | M | 78 | 2 | Walk unaided outdoor | 22 | 42 | 1 | 5/1 | 1 | 20 |
| 6 | M | 71 | 3 | Walk unaided indoor | 28 | 40 | 1.5 | 5/1 | 1 | 26 |
| 7 | F | 83 | 1 | Walk unaided outdoor | 28 | 40 | 1 | 5/2 | 1 | 25 |
| 8 | F | 85 | 2 | Walk with stick indoor | 22 | 35 | 2.5 | 8/3 | 1 | 24 |
| 9 | M | 74 | 4 | Walk unaided indoor | 22 | 30 | 1 | 7/2 | 1 | 3 |
| 10 | F | 77 | 3 | Walk with quadripod indoor | 22 | 35 | 2.5 | 9/2 | 2 | 17 |

ASA = American Society of Anaesthesiologists; F = female; M = male; MMSE = mini mental state examination; Postop = postoperative.

Methods

Patients

From August 2008 to November 2009, 10 patients (5 male and 5 female) with a mean age of 78.8 years (range: 71–85 years) sustained either valgus impacted (Garden type I) or undisplaced (Garden II) femoral neck fracture. Fixation with two parallel screws was performed under local anaesthetic infiltration. Their medical health status was recorded by using the American Society of Anaesthesiologists (ASA) physical status grading system.⁶ The pre-injury walking abilities are shown in Table 1.

The exclusion criteria included displaced fractures of the femoral neck or those that required close reduction after X-ray screening; drug allergy to local anaesthesia; patients with dementia with a Mini Mental State Examination (MMSE) score <18; and any potentially uncooperative patients for the local anaesthetic procedure.

Surgical technique

The patient is put on a traction table without any axial traction applied. Before the skin preparation and draping, the exact incision site for pinning the fracture *in situ* is marked with the help of X-ray image intensifier (Figure 1). An anaesthetist is present in case the patient needs extra analgesia or sedation during the operation.

A total of 20 mL 1% plain lignocaine (Xylocaine) without adrenaline was used for the whole procedure. Around 5 mL local anaesthetic solution was infiltrated into the planned skin incision (~2 cm). Anaesthetic solution was injected through an angio-catheter down to the periosteum, along the direction of the planned screw tract under radiological control (Figure 2). Ten millilitres of anaesthetic solution was infiltrated into the periosteum as well as along the two subcutaneous pathways for the screws. The remaining 5 mL anaesthetic solution was reserved for inadequate pain control during the operation. Insertion of two parallel guide pins was performed under an image intensifier, and only the near bone cortex was drilled. Two self-tapped, short-threaded, 7.0-mm arbeitsgemeinschaft für osteosynthesefragen (AO) cannulated screws were inserted in parallel fashion with the level of screw heads at or below the lesser trochanter.

After the operation, oral analgesic and 50 mg tramadol (Stada) injections were prescribed for pain relief on demand. All patients had immediate full-weight-bearing walking exercise after surgery and follow-up at the fracture clinic with radiographs taken on each visit. The protocol has been shown in Figure 3.

Results

All 10 patients were able to complete the whole procedure under local anaesthesia. No extra intraoperative analgesic including pethidine or fentanyl, or conversion to other form of anaesthesia was needed. Seven out of 10 patients experienced minor groin discomfort during screw tightening but it was only transient and tolerable. The mean size of the wounds was 1.5 cm (range: 1–2.5 cm) and the mean operative time was 39 minutes (range: 30–60 minutes).

The postoperative visual analogue scale pain score on the first and seventh days was 5.9 (range: 2–9) and 1.9 (range: 1–3), respectively. Two patients required up to two extra doses of intramuscular tramadol injection for postoperative pain control. The average time for the patients to be mobilised after the operation was 2.2 days (range: 1–9 days). The mobilisation was delayed to 9 days after the operation in one patient because of chest infection. The length of hospital stay ranged from 2 days to 52 days. All patients were satisfied with the outcome of operation and found this local anaesthetic procedure acceptable.

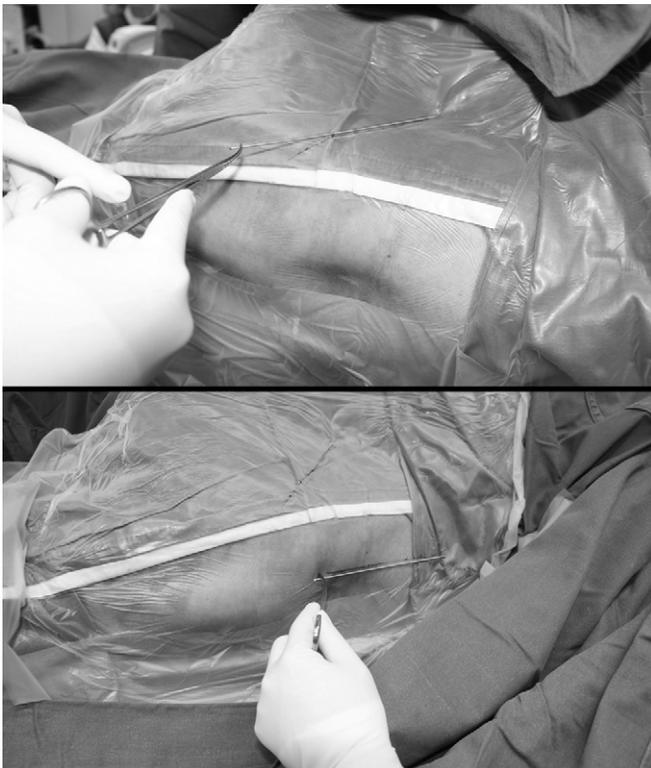


Figure 1. Mark the planned incision site under X-ray control with a K-wire.



Figure 2. Infuse anaesthetic solution by using an angiocatheter (arrow) to the planned screw tract under X-ray control.

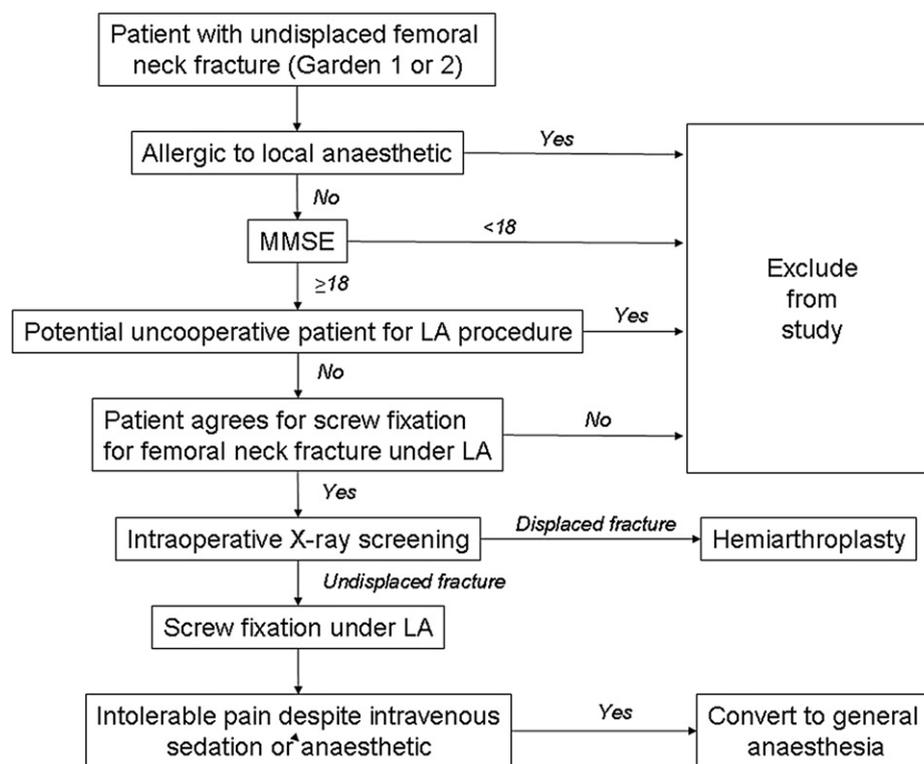


Figure 3. Study protocol. LA = local anaesthesia; MMSE = mini mental state examination.

There was no wound or implant-related complication detected at 1 month postoperatively. Eight out of 10 patients completed an average of 23.1 months (range: 17–28 months) follow-up. The radiographs confirmed that all fractures had healed. No implant-related complication or avascular necrosis of the femoral head was detected. One patient died after 3 months and another after 8 months after the operation for unrelated medical problems.

Discussion

In the literature review, successful nonoperative treatment for impacted femoral neck fractures was reported,⁷ but the incidence of fracture displacement was as high as 46% in one study.⁸ When a femoral neck fracture displaces, it results in fracture malunion, fracture nonunion, or avascular necrosis. A higher morbidity operation such as arthroplasty may be required.¹

Limited dose of local anaesthetics is considered to be safer and more acceptable when compared to spinal or general anaesthesia, especially in patients with multiple medical comorbidities. Spinal anaesthesia causes postoperative lower limb weakness, hypotension, and urine retention, which prevent patients from immediate postoperative mobilisation.^{3–5} However, local anaesthetics may cause serious cardiac problems if there is overdose, and therefore it must be administered with caution.

The patients must be mentally competent to give their consent and understand the operation of hip screw fixation under local anaesthesia. They should be informed that conversion to general anaesthesia will be required if intolerable pain is experienced during the procedure even after sedation or intravenous analgesia. Some patients with exaggerated behaviour or response to pain stimuli should be excluded. One way to assess their response to pain stimuli is to observe their behaviour during blood sampling

and intravenous cannula insertion. Potential uncooperative patients such as intravenous drugs users and psychiatric patients are best avoided. Moreover, obese patients with a thick layer of subcutaneous fat also make the anaesthetic technique potentially more difficult.

Screw fixation under local anaesthesia relies on accurate wound incision and placement of the guide pin to minimise the pain during the procedure. Avoiding the large vessel perforators,⁹ intraoperative blood loss should therefore be minimal. Our study confirms that hip screw fixation can be safely performed under local anaesthesia in selected patients. The patients with high anaesthetic risk of spinal or general anaesthesia will benefit most. Randomised controlled trials can be conducted to compare various forms of anaesthesia for hip screw fixation in the future.

In conclusion, we found that it was technically feasible to perform hip screw fixation under local anaesthesia in selected patients. It may be a good alternative means of anaesthesia for patients with undisplaced femoral neck fracture undergoing hip screw fixation.

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