

CASE REPORT

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Adductor canal block to manage flexion contracture deformity (FCD) of knee before total knee replacement (TKR) - a case report

Jadon Ashok^{1,3*}, Sudarshan Pavan², Sinha Neelam¹ and Chakraborty Swastika¹

Abstract

Background: The fixed contracture deformity (FCD) which is often present in patients awaiting total knee replacement (TKR) affects the surgical outcome. Therefore, it is necessary to reduce the severity of the FCD before the TKR surgery. Physiotherapy, including active stretching and exercise to increase range of motion are commonly practiced techniques. However, due to the presence of pain, patients are often unable to cooperate and perform exercise up-to the desired levels. We used continuous adductor canal block (CACB) in two patients with severe FCD scheduled for TKR surgery to decrease their pain during physiotherapy and to help them in increasing their range of motion to achieve early fitness for surgery. This approach is not documented and published earlier in the medical literature.

Case presentation: Two female patients aged 58 and 68 years were scheduled for TKR surgery with severe flexion contracture deformity of both limbs (70°–90°). Due to severe contracture deformity surgeon suggested improvement in ROM before surgery. Ultrasound-guided adductor canal block was given, and catheters were inserted in the adductor canal. Continuous infusion of local anesthetic and bolus injection before active stretching was given. Both patients had good pain relief in existing arthritic pain and pain during active stretching. The flexion deformity was reduced in both the patients up to 30°. The technique of adductor canal block with continuous infusion also provided excellent postoperative analgesia and helped in early mobilization without affecting the muscle strength of lower limbs.

Conclusion: In two patients of severe flexion contracture deformity, the continuous adductor canal block helped to reduce the degree of deformity before the total knee replacement surgery. It also provided excellent pain relief in postoperative pain and helped in early postoperative mobilization without muscle weakness.

Keywords: Adductor canal block, Total knee replacement, Contracture, Rehabilitation, Osteoarthritis knee

Background

Severe arthritis of knee results in flexion contracture deformity (FCD). Total knee replacement (TKR) is often advised in such cases, which corrects the contracture, relieves pain and stabilizes

movements of knee joint (Hwang YS et al. 2016; Jain JK et al. 2013). However, outcome of TKR is influenced by preoperative flexion deformity (Jain JK et al. 2013; Goudie ST et al. 2011; Mitsuyasu H et al. 2011; Veeraraghavan RR et al. 2018).

Therefore, all the possible measures are to be taken to minimize preoperative FCD for better outcome of TKR. Surgeons often used serial wedging casts after stretching under general anesthesia. However, it is very cost intensive and requires multiple exposure to

* Correspondence: jadona@rediffmail.com

¹Department of Anaesthesia & Pain Relief Service, Tata Motors Hospital, Jamshedpur 831004, India

³Jamshedpur, India

Full list of author information is available at the end of the article



Fig. 1 A1, A2, A3 Flexion contracture deformity (FCD) in first patient. B1–B3 FCD in second patient

anesthesia and frequent hospital admissions. Therefore, an easy and affordable approach which can facilitate the increment in range of movement (ROM) with reduction in pain and stiffness is highly warranted. Adductor canal block (ACB) is relatively new ultrasound-guided nerve block used for postoperative analgesia after TKR surgery (Lund J et al. 2011). We used continuous adductor canal block (CACB) to manage patients with severe preoperative FCD scheduled for TKR to facilitate physiotherapy. We

report here two patients who presented with severe FCD and pain before TKR and were managed successfully with this approach.

Case presentation

Two female patients aged 58 and 68 years presented with severe FCD of both limbs (70°–90°) due to osteoarthritis for TKR surgery (Fig. 1). Due to severe FCD surgeon suggested improvement in ROM before surgery. However, due to stiffness and severe pain during

physiotherapy, patients were unable to perform up to desired level. Initially for 2 days, injectable analgesics were given; however, pain relief was inadequate. Bilateral adductor canal block with insertion of catheter was decided to facilitate manipulation and stretching and to provide pain relief. Patients were educated about NRS (numeric rating scale) pain scoring on 11 points scale where score 0 = no pain and 10 = severe pain. We used a scale, which also incorporated facial expression related to severity of pain for easy understanding by uneducated patients. Ethical approval was taken from ethical committee of hospital. After informed consent and baseline pain scoring (at rest and on movement), first patient was taken to procedure room and non-invasive monitors for blood pressure, oximeter, and ECG (electro cardio graph) were connected. Using sterile technique (cap, mask, and sterile transparent camera cover for ultrasound probe and sterile ultrasound gel), bilateral adductor canal block (ACB) was given. A high-frequency ultrasound probe (6–13 MHz, SonoSite M-turbo, FUJIFILM SonoSite, Gurugram, India Pvt. Ltd.) was placed transversely at mid-thigh-level and deep femoral artery in the adductor canal was identified (Fig. 2a). Needle entry point at skin (lateral edge of probe) was anesthetized with 3 ml 1% lidocaine and 18 G Tuohy needle was inserted from anterolateral to posterior-medial direction deep to the adductor membrane, near deep femoral artery in the adductor canal. Hydro-dissection of tissue plane with 5 ml normal saline was done. Once correct spread of saline (around the artery) was noticed, 20 G epidural catheter was inserted leaving about 2.5–3.0 cm catheter in the adductor canal (Fig. 2b, c). Twenty milliliters 0.25% bupivacaine was given through catheter and dressing was done (Fig. 3a–d). After 30 min, pain on rest and on movement was assessed by NRS. Resting pain reduced to 2/10 from 5/10 and on movement pain reduced to 3/10 from pre-block level of 9/10. An elastomeric Pump (DOSI-FUSER[®] Leventon, S.A.U.) Capacity 250 ml with variable flow rates 2–14 ml/h, filled with 0.12% ropivacaine and 0.8 µg/ml fentanyl (300 mg ropivacaine and 200 µg fentanyl in 250 ml solution) was started @ 12 ml/h and both catheters were connected to the pump through a y-connector. Each side received 6 ml/h of the drug. Other than infusion of LA, patient was given orally tablet (paracetamol 325 mg + tramadol 37.5 mg) every 12 h and diclofenac gel locally twice daily.

Pain on rest and on movement was recorded three times (8 am, 2pm, and 8pm) in a day. Every day, 10 ml 0.2% ropivacaine in each catheter was given 30 minutes before active stretching of limbs. First surgery was done after 7th day of catheter insertion and other side was operated after 1 week of first surgery. Catheters were removed after 4th day of second surgery. Second patient was also managed

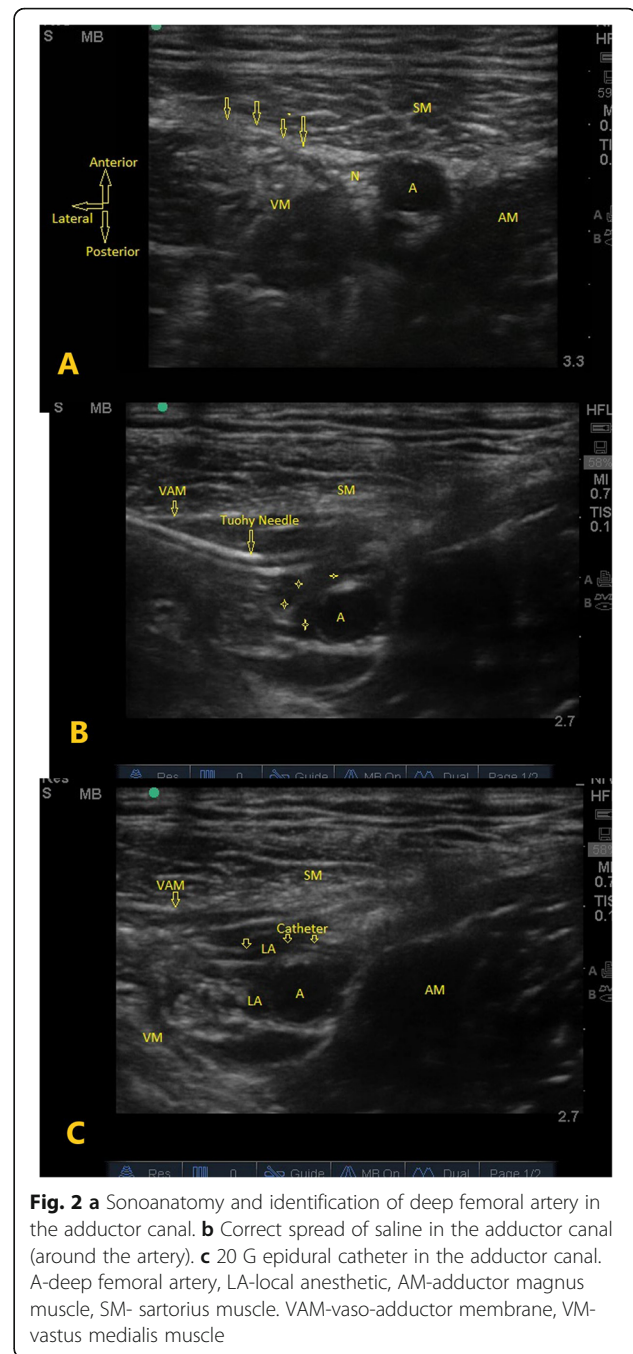


Fig. 2 a Sonoanatomy and identification of deep femoral artery in the adductor canal. **b** Correct spread of saline in the adductor canal (around the artery). **c** 20 G epidural catheter in the adductor canal. A-deep femoral artery, LA-local anesthetic, AM-adductor magnus muscle, SM- sartorius muscle. VAM-vaso-adductor membrane, VM-vastus medialis muscle

in similar manner. Both patients had excellent pain relief (NRS score remain < 4 on movement and 4–5 on stretching) reduction in FCD (< 30°) was achieved before scheduled TKR surgery. The residual FCD was corrected during surgery (Fig. 4 A1, A2, and B1, B2).

Discussion

Preoperative reduction in the degree of FCD is essential for successful TKR surgery. Goudie et al. (Goudie ST



Fig. 3 **a** Positioning for adductor canal block, patient unable to extend the lower limbs due to flexion contracture deformity. **b** Observation for spread of local anesthetic after catheter insertion. **c** Tunnelling of catheter for stability. **d** Dressing and labeling of catheters for safety. A-deep femoral artery, LA-local anesthetic, AM-adductor magnus muscle, SM-sartorius muscle. VAM-vaso-adductor membrane, VM-vastus medialis muscle



Fig. 4 A1, A2 Postoperative results of first patient. B1, B2 Postoperative results in second patient

et al. 2011) concluded that there is 2.3 times greater risk of a residual fixed flexion deformity after TKR if there is a pre-existing FCD. Surgical correction is the last resort and severe degree of FCD requires special surgical techniques and often considered curse to the knee arthroplasty surgeons (Veeraraghavan RR et al. 2018). Active and passive stretching remains the cornerstone of FCD management. Adductor canal block has been used effectively to manage postoperative pain after TKR surgery. We used CACB with continuous infusion of diluted local anesthetic (ropivacaine 0.12%) for pain relief and intermittent boluses of local anesthetic (ropivacaine 0.2%, given 30 min before physiotherapy) for stretching and improving ROM. This technique was successful to reduce the pain during rest as well as during stretching and other exercises for increasing mobility. The adductor canal catheter inserted for preoperative exercise and stretching, also used for postoperative pain relief and mobilization. As, it is essential to correct fixed flexion deformities at the time of TKR, it is equally important in the post-operative course to maintain the correction (Su 2012). In our cases, the catheters were helpful to reduce FCD from 90° to < 30° in first case and

from 70° to < 30° in second case. The remaining FCD was corrected easily during surgery (Fig. 4a, b). In our both cases, CACB not only helped in preoperative physiotherapy and postoperative analgesia but also helped in good quality of post-operative physiotherapy by excellent pain control without compromising the muscle strength (Grevstad U et al. 2015; Canbek U et al. 2019).

Conclusion

Continuous adductor canal block (CACB) helped in the management of preoperative flexion contracture deformity (FCD) in two patients scheduled for TKR surgery. FCD was reduced up to 30° in both patients. CACB was very useful technique to manage FCD in our clinical setup; however, its generalized utility needs revalidation for clinical and financial implications.

Abbreviations

@: At the rate of; ACB: Adductor canal block; CACB: Continuous adductor canal block; ECG: Electro cardio graph; FCD: Fixed contracture deformity; LA: Local anesthetic; NRS: Numeric rating scale; ROM: Range of movement; TKR: Total knee replacement

Acknowledgements

Not applicable

Ethics approval consent to participate

Ethical approval was taken from ethical committee of Tata Motors Hospital, India and consent to participate from patient is taken.

Authors' contributions

AJ: concept, manuscript writing, final draft. PS: editing, review, observation. NS: editing, review, intervention. SC: intervention, review of literature, observation. All the authors have read and approved the final manuscript.

Funding

No external or other funding is involved for declaration.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Written informed consent to present, discuss and publish the patient's medical information, management details, and pictures was taken.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Department of Anaesthesia & Pain Relief Service, Tata Motors Hospital, Jamshedpur 831004, India. ²Department of Orthopedics, Tata Motors Hospital, Jamshedpur 831004, India. ³Jamshedpur, India.

Received: 14 July 2020 Accepted: 1 October 2020

Published online: 15 October 2020

References

- Canbek U, Akgun U, Aydogan NH, Kilinc CY, Uysal AI (2019) Continuous adductor canal block following total knee arthroplasty provides a better analgesia compared to single shot: a prospective randomized controlled trial. *Acta Orthop Traumatol Turc* 53:334–339
- Goudie ST, Deakin AH, Ahmad A, Maheshwari R, Picard F (2011) Flexion contracture following primary total knee arthroplasty: risk factors and outcomes. *Orthopedics* 34:855–859
- Grevstad U, Mathiesen O, Valentiner LS, Jaeger P, Hilsted KL, Dahl JB (2015) Effect of adductor canal block versus femoral nerve block on quadriceps strength, mobilization, and pain after total knee arthroplasty. *Reg Anesth Pain Med* 40:3–10
- Hwang YS, Moon KP, Kim KT, Kim JW, Park WS (2016) Total knee arthroplasty for severe flexion contracture in rheumatoid arthritis knees. *Knee Surg Relat Res* 28:325–329
- Jain JK, Sharma RK, Agarwal S (2013) Total knee arthroplasty in patients with fixed flexion deformity: treatment protocol and outcome. *Current Orthopaedic Practice* 24:1–6
- Lund J, Jenstrup MT, Jaeger P et al (2011) Continuous adductor-canal-blockade for adjuvant post-operative analgesia after major knee surgery: preliminary results. *Acta Anaesthesiol Scand* 55:14–19
- Mitsuyasu H, Matsuda S, Miura H et al (2011) Flexion contracture persists if the contracture is more than 15° at 3 months after total knee arthroplasty. *J Arthroplast* 26:639–643
- Su EP (2012) Fixed flexion deformity and total knee arthroplasty. *J Bone Joint Surg Br* 94:112–115
- Veeraraghavan RR, Vanchi PK, Mohan KM (2018) Pre-operative fixed flexion deformity a curse to the knee arthroplasty surgeon. *Int J Res Orthop* 4:854–856

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