ISSN 2515-8260 Volume 10, Issue 01, 2023

Role of transversus abdominis plane block in femoral thromboembolectomy: A case series

Running title: TAP block in femoral thromboembolectomy

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ABSTRACT

Femoral thromboembolectomy surgery is on the rise nowadays due to increased number of cardiac interventional procedures. In this Procedure General or spinal anaesthesia is not often favored due to anticoagulants and associated comorbid conditions. Transversus abdominis plane block (TAP Block) may provide a reasonable alternative for this procedure. We present a case series of 16 patients undergoing emergency femoral artery thrombo-embolectomy under TAP block. TAP block was performed using 30 mL of 0.25% Bupivacaine. Block efficacy was graded as complete, partial, and failed block. Complete Block was achieved in seven (44%) patients. Five patients were administered a single bolus of butorphanol intraoperatively, while four patients required two boluses of butorphanol, and this group was categorized as a partial TAP block. None of the patients required general anaesthesia. Thus TAPB can be considered an alternative anaesthesia approach for femoral thromboembolectomy.

Keywords: Regional Anaesthesia, Transversus abdominis plane block, rescue analgesia, femoral thromboembolectomy

INTRODUCTION

Femoral artery access is a common mode of vascular access for coronary angiography and cardiac interventions worldwide. These interventions may be accompanied by complications such as bleeding, dissection, hematoma, arteriovenous fistula, and thrombosis of the femoral artery.[1]

ISSN 2515-8260 Volume 10, Issue 01, 2023

Femoral artery thrombosis is an emergency and in severe cases, may cause ischemia, and gangrene of the lower limb.[2] Surgical femoral thromboembolectomy has been in practice for restoring limb perfusion for many decades.[3] In this subset of patients general and regional anaesthesia is not favored due to associated heart failure[4] And ongoing antiplatelet drugs respectively.[5] In these situations local nerve blocks are a good alternative and transversus abdominis plane block (TAP block) is one of the viable options.

In a TAP block, the thoracolumbar nerves originating from the T6 to L1 spinal roots are anaesthetized.[6] L1 generally gives dermatomal supply to the anterior and medial part of the thigh in infra-inguinal region. An injection medial to anterior superior iliac spine is desired to block L1 dermatome.

TAP block is commonly used as an adjunct to perioperative analgesia in a wide variety of surgeries, but reports on its role as a sole anaesthetic technique are scarce.[7,8] Here we present a case series of femoral thromboembolectomy surgery in TAP block as a sole anaesthetic technique.

MATERIALS AND METHODS

After taking permission from Institutional Ethical Committee, we enrolled the American Society of Anaesthesiologists (ASA) Grade III and IV consecutive patients posted for emergency femoral artery thromboembolectomy post cardiac interventional procedure via femoral artery route for a period of 1 year.

Obese patients, patients with local anaesthetic allergy and patients who refused to give consent were excluded from the study. After an explanation of the procedure, written and informed consent, all patients underwent pre-anaesthetic evaluation. They were informed to rank pain severity on 0 to 10 points according to the Numeric Pain Rating Scale (NPRS) where '0' represents “no pain” to '10' represents the “worst pain” in the postoperative period. Before the procedure electrocardiogram, noninvasive blood pressure (NIBP), and pulse oximeter were connected. Under all aseptic precautions, an ultrasound (USG)-guided lateral TAP block was given using a USG system (Philips- CX 50 system) with a high-frequency (6–13 MHz) linear array transducer by the technique described by Tsai et al.[9]

With the in-plane technique, a 22G 100-mm long block needle (stimuplexRA B|BRAUN) was advanced, and bupivacaine 0.25%, 30 mL, was injected [Figure 1]

After confirming sensory block, the surgery was started. Vitals were recorded. Any discomfort or pain during the procedure was managed with an intravenous bolus of 10 µg/kg butorphanol. If pain persisted a second bolus of butorphanol 10 µg/kg was given and followed by a wide field block with 2% lignocaine if the patient still complained of pain. As a rescue plan, preparation for the administration of general anaesthesia was done, if the above measures failed [figure 2] Patients were monitored postoperatively for pain, postoperative nausea vomiting (PONV). Postoperative pain severity was measured using a NPRS every 2 hourly for the first 6 hours and then 6 hourly up to 24 hours. If the score more than 4, rescue analgesia with paracetamol 15 mg/kg IV was given. The duration of analgesia was considered as the time interval from the

ISSN 2515-8260 Volume 10, Issue 01, 2023

immediate postoperative period until the NPRS score approaches 4. Data were collected by an independent observer, and the results were described as median and percentage.

TAP Block was categorized into three classes depending upon the need for rescue methods. [Table1] If no rescue method was required then the block was said to be complete. If at least one dose of butorphanol was required, it was a partial block. The block was considered a failure if local or general anaesthesia was used.

RESULTS

A total of 16 patients were enrolled with ages ranging from 48 years to 84 years. Among these eight patients were of primary angioplasty for acute Myocardial Infarction (MI), four patients were of elective coronary angioplasty and the remaining four patients were post intra-aortic balloon pump (IABP) insertion. Among these, eight patients were symptomatic for heart failure but not mechanically ventilated. two patients were on dual inotropes noradrenaline and dopamine infusion. All patients were on dual antiplatelets while half of the patients got low molecular weight heparin. Demographic characteristics and intraoperative parameters of patients are summarised in Table 2. Haemodynamic parameters remained within normal limits. Complete Block was achieved in seven (44%) of the patients and none of the patients required general anaesthesia. Five patients were administered a single intraoperative butorphanol bolus while four patients received two boluses of butorphanol. A total of three (19%) patients received both butorphanol bolus and lignocaine infiltration and this group was categorized as failed TAP block. Postoperative median NPRS score was below 3 in 30% of the patients and five patients required paracetamol supplementation in the postoperative period at 6 and 10 hours, respectively. The median duration of analgesia was 18 hours (range: 10–24 h). After the procedure, clinical signs and the symptoms of the thrombosis were resolved rapidly. None of the patients complained of PONV or any other complications. No patient required general anaesthesia.

DISCUSSION

TAP block is an abdominal field block acting on the nerve supply of the anterior abdominal wall. Anterior to anterior superior iliac spine (ASIS) approach of the TAP blocks lower levels of sensory nerves ranging from T10 to L1 and is therefore appropriate for surgeries with the infra-umbilical incision. Although TAP block has been demonstrated to be successful as a part of multimodal analgesia following various hepatobiliary and gastrointestinal surgeries[7,8] reports on its role as surgical anaesthesia for infra-inguinal surgeries are lacking. Hasan et al. reported on open gastrostomy under bilateral sub-costal TAP block, and only one patient required local anaesthetic injection on the upper end of incision.[7] Lee et al. reported a case of high-risk elderly patient operated for open gastrostomy under left subcostal TAP block.[8] A case of large incisional epigastric hernia repair in a high-risk cardiac patient (ASA III), which was operated under a bilateral subcostal TAP block, was reported by Bihani et al.[10]

But in all these patients, surgery was done on the anterior abdominal wall above the inguinal ligament in the dermatomal distribution of T6 to T12. We found no case reports or case series on the infra-inguinal region supplied by L1 dermatome.

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As we know that anatomical variation, local anaesthetic spread, and extent of surgery plays an important role in the success of block, probably for the same reasons we found TAP block successful in seven (44%) patients, while five patients required single bolus of butorphenol and one patient required 2 boluses of butorphenol. In this study only three patients required local field block with lignocaine 2% in addition to two boluses of butorphenol and this category of patients were labelled as block failure. For access to the common femoral artery, an incision is generally placed just inferior to the inguinal ligament, but it is the distal extent of the incision which plays a crucial role in the success of the block.

Advantages of TAP block are reduced requirement of opioids and avoidance of cardiorespiratory stress of monitored anaesthesia care and general anaesthesia respectively. When compared with the central neuraxial blockade, the advantages are the absence of sympathetic and motor block and avoidance of associated hemodynamic perturbations. But most importantly the risk of spinal hematoma because of associated dual antiplatelet and anticoagulant medications is minimized.

There are a couple of limitations in our study. First, we enrolled consecutive ASA class III/IV patients, which were deemed unfit or high risk for general anaesthesia/regional anaesthesia without randomisation. Second, the size of our study population precluded us from establishing whether the intervention was effective sufficiently. More significant conclusions may have been obtained with a larger sample size.

CONCLUSION

Transverses abdominis plane block can be utilised as the only anaesthetic in high-risk patients undergoing infra-inguinal surgery, and simultaneously, it is possible to provide excellent postoperative analgesia, which enhances patient and surgical results.

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Abbreviations

TAPB - Transversus abdominis plane block

NPRS- Numeric Pain Rating Scale

IABP - intra-aortic balloon pump

ASA- American Society of Anaesthesiologists

NIBP - Non invasive blood pressure

USG - Ultrasound

ICU - intensive care unit

PONV - Postoperative nausea and vomiting

ASIS - Anterior superior iliac spine

Flow sheet of rescue methods

ISSN 2515-8260 Volume 10, Issue 01, 2023

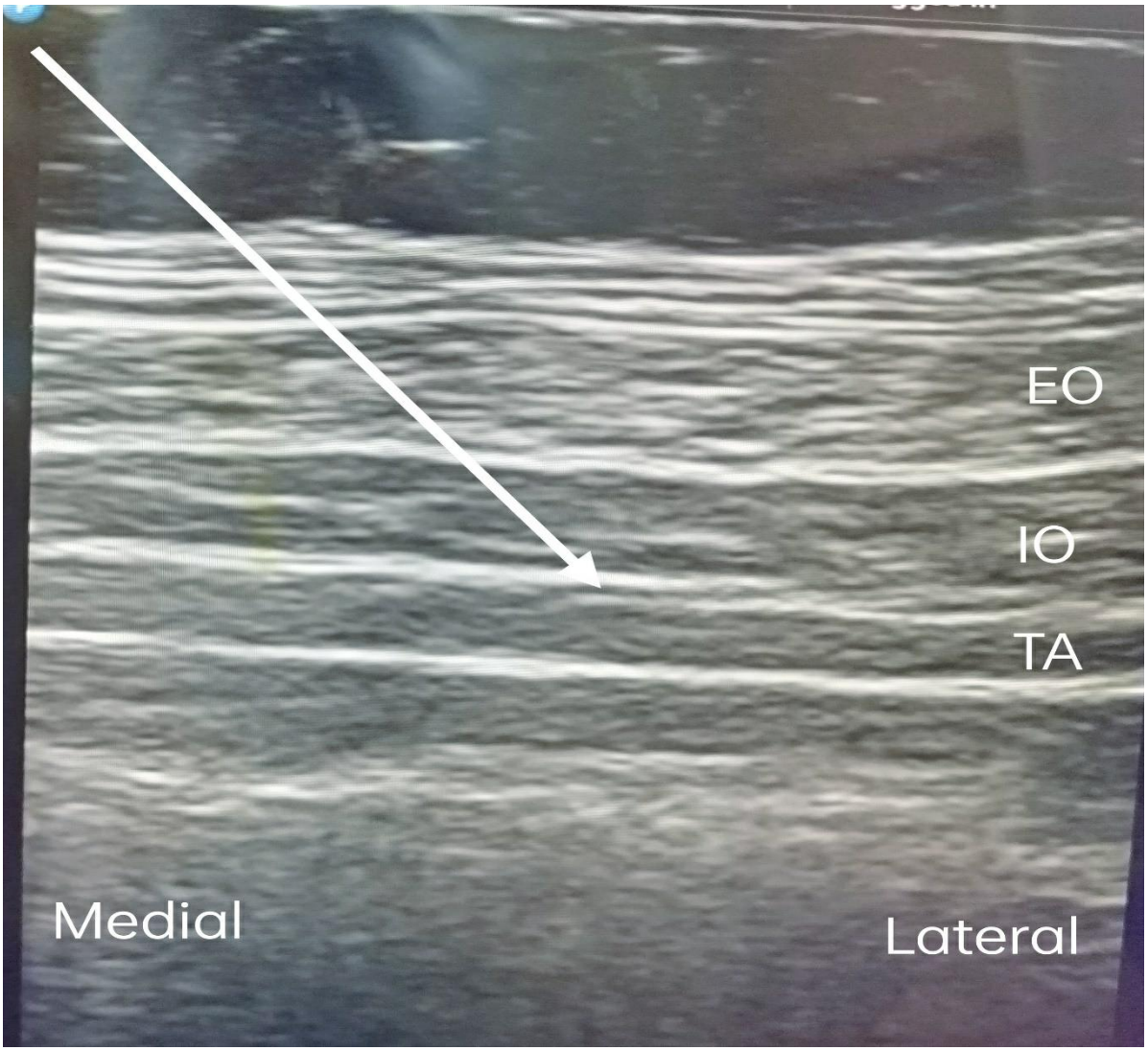

Figure 1: Site of the regional block

Long oblique arrow indicating needle path and Three small Arrows indicating TAP block plane. EO: External Oblique, IO: Internal Oblique, TA: Transverse abdominis muscle.

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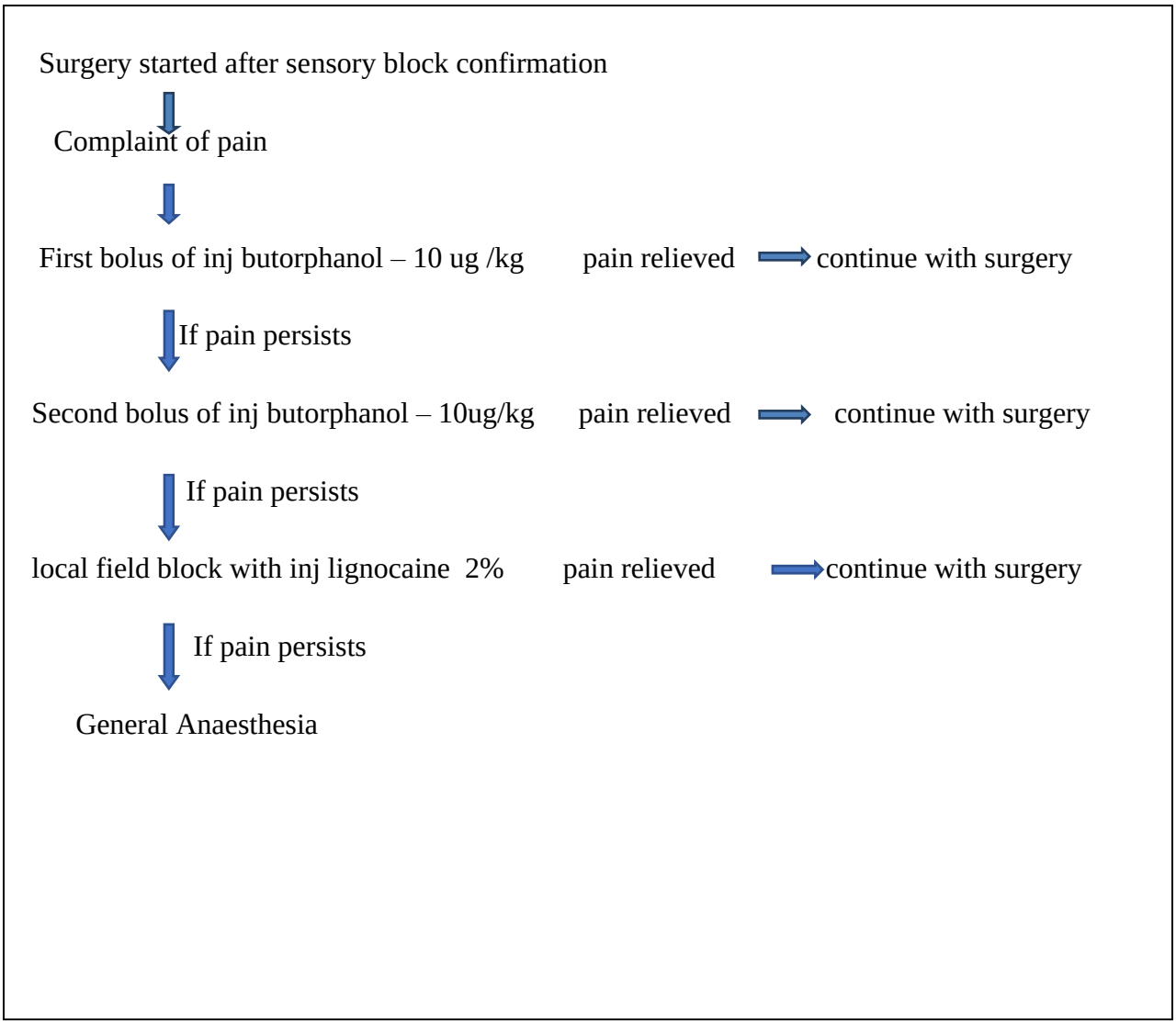

Figure 1: Flow sheet of rescue methods

Rescue method used	TAP block category	No. of patients (percentage)
No rescue method	Complete block	7 (44%)
Butorphanol one dose	Partial block	5 (31%)
Butorphanol two doses	Partial block	1 (6.2%)
Butorphanol + Local anaesthesia field block	Block failure	3 (19%)

General Anaesthesia	Block failure	0

Table 1: Categorisation of TAP block on the basis of use of rescue analgesia

Case	Age and sex	ASA grading	HR median (range)	MAP median (range)	Inj butorphenol (bolus-10µg/kg)	Local anesthesia Injection (lignocaine 2%)	Block category
1	53/M	3	74(58-88)	78 (62-85)	-		Complete
2	75/F	4	88(60-98)	66(60-75)	-	-	Complete
3	82/M	3	80(62-92)	70(56-80)	1 bolus	-	Partial
4	84/M	3	79(70-87)	70(62-76)	2 bolus	-	Partial
5	68/F	4	84(74-96)	72(62-78)	1 bolus	-	Partial
6	75/M	3	60(52-76)	63(55-70)	1 bolus	-	Partial
7	72/M	3	75(65-83)	68(62-75)	1 bolus	-	Partial
8	55/M	3	77(64-86)	72(66-77)	-	-	Complete
9	58/M	4	68(58-80)	86(80-92)	-	-	Complete
10	71/F	4	76(68-84)	90(82-102)	-	-	Complete
11	67/F	3	75(64-82)	92(80-110)	2 bolus	LA Given	Failure
12	56/M	3	82(72-90)	90(82-98)	-	-	Complete
13	48/M	4	80(65-94)	86(82-94)	1 bolus	-	Partial
14	62/M	3	76(66-85)	74(65-82)	2 bolus	LA given	Failure
15	77/F	3	77(68-86)	78(70-85)	2 bolus	LA given	Failure
16	75/F	3	81(69-88)	75(70-82)	-	-	Complete

Table 2: Patient Demographic and intra-operative characteristics.

ASA: American Society of Anaesthesiologists, HR: Heart Rate, MAP: Mean Arterial Pressure, LA: Local Anaesthesia