The comparison of apex femoral triangle block versus femoral nerve block for attainment time of discharge criteria after total knee arthroplasty

N.Sakai, C.Taruishi, T.Sudani, M. Takada
Dep. Anesthesiology, Daiyukai General Hospital, Aichi, JAPAN

Introduction

Femoral nerve block (FNB) is a gold standard for postoperative pain management after total knee arthroplasty (TKA) however it leads quadriceps weakness. "So called" adductor canal block (ACB), which is generally defined as a block for a branch of femoral nerve where the injection point is mid-thigh, is a effective method without serious quadriceps weakness however the inserting point of ACB might be too high and cause quadriceps serious weakness when local anaesthesia (LA) extremely spread. Apex femoral triangle block (aFTB) is a excellent counter plan for answering the problem of ACB because of the definite visualisation with ultrasound, in addition very small amount of LA is needed to block for the surgical site. We compared the effect of aFTB for postoperative attainment of discharge criteria with FNB with double-blind manner.

Materials & Methods

This trial was approved by IRB and we received the informed consent from all the subjects (UMIN26045). A total of 182 subjects was randomized to receiving FNB or aFTB with 0.25% levobupivacaine 10mL before receiving TKA. Tibial nerve block with 0.25% levobupivacaine 10mL and multimodal analgesia protocol including intraoperative periarticular injection, NSAIDs, paracetamol and dexamethasone were provided.

<Block Precedure>

@FNB: ultrasound-guided visualization of the transverse scan of femoral nerve at the inguinal crease and injected LA below femoral nerve with in-plane tech

@aFTB: indentification of the media leads of sartorial and adductor longus muscles and the cross point of both edges as an apex of femoral triangle, injected LA laterally to the femoral artery.

We evaluated that aFTB was non-inferior to FNB for the attainment hours of early discharge criteria (good pain control with oral analgesics without opiate, ability of knee flexion above 90 degrees, and gait rehabilitation without a help of physical therapist or nursing staff) as a primary outcome. We considered the non-inferior margin(Δ) as 6 hours. And we evaluated the superiority to the FNB for the ability of straight leg raise (SLR) test on postoperative 1 hours and day 1. We also tested the pain scores, consumption of additional analgesics, attainment days of deep knee flexion and knee range of motion (ROM) at postoperative 6 months.

Results

	FNB(n=79)	aFTB(n=83)	95% CI	P value
Age(y)	72+8	76+7	1.3-6.0	0.002
Gender(F/M)	65/14	68/15	0.40-2.4	1.00
ASA(1/2/3)	6/71/2	10/70/3		0.64
Height(cm)	154+9	153+9	-3.6-1.78	0.49
Weight(kg)	62+11	59+13	-6.1-1.3	0.2
BMI	26.1+3.8	25.5+4.0	-1.8-0.6	0.34
Operation_Time(min)	109+16	107+16	-6.8-3.0	0.45
Tourniquet_Ischmeia(min)	98+16	97+12	-5-4	0.79
Bleeding(mL)	159+120	171+86	-19-45	0.45
Intravenous_Fluid(mL)	1033+220	1068+208	-31-102	0.3
Urine(mL)	298+236	306+221	-62-80	0.81
Water_Balance(mL)	577+254	591+275	-68-96	0.74

	FNB(n=79)	aFTB(n=83)	95%CI	p value
VRS_POD1_rest	0(0-4)	0(0-2)		0.15
VRS_POD2_rest	2(0-5)	2(0-6)		0.23
VRS_POD3_rest	1(0-5)	1(0-5)		0.09
VRS_POD1_move	2(0-6)	3(0-6)		0.21
VRS_POD2_move	4(1-8)	4(1-9)		0.26
VRS_POD3_move	1(0-5)	1(0-5)		0.14
Analgesics_total	1(0-5)	1(0-7)		0.15
Flexion_Pre (degree)	128+19	131+14	-2-9	0.21
Flexion_POD1 (degree)	65+16	63+16	-7-3	0.51
Flexion_POD2 (degree)	82+13	84+10	-2-5	0.28
Flexion_POD3(degree)	94+11	96+10	-2-5	0.32
Flexion_POD7 (degree)	112+20	113+17	-5-6	0.79
Flexion_POD14(degree)	123+8	124+7	-2-3	0.48
Flexion_6month(degree)	131+11	131+16	-5-4	0.89

	FNB(n=79)	aFTB(n=83)	95% CI	P value
Walking(day)	2(2-4)	2(2-4)		0.72
120degree_flexion(day)	7(2-30)	6(3-29)		0.44
Early_discharge(hour)	63+21	61+17	-8.5-3.0	0.36

Discussion

Femoral nerve has many branches to innervate thigh muscles and take a blockade of vastus medialis muscle is essential for pain relief after TKA. Some cadaver studies showed that aFTB could block saphenous and the branch for vastus medialis muscle. Low amount of local anaesthetics would not spread to the branches for another quadriceps muscles including vastus lateralis, vastus intermedius, and vastus longus muscle. Our results indicates that aFTB could provide not only postoperative pain relief but good postoperative early rehabilitation and long-term pain relief at 6 months after surgery which was not statistically different from FNB. In addition, aFTB could spare the quadriceps strength more compared with FNB on POD1, which would promoted fast-track rehabilitation with day zero or day one walking.

Conclusions: The trial findings suggest that aFTB provides noninferior early attainment time for discharge criteria and acquires superior ability of SLR test for patients undergoing TKA.