

A Study of Functional Outcome in Total Knee Arthroplasty with or Without Tourniquet?

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ABSTRACT:

Background: A tourniquet is commonly used in total knee arthroplasty (TKA). However, the effectiveness and safety of tourniquets are debated. We performed this study to investigate whether patients benefit from the tourniquet use or without tourniquet in TKA.

Materials and Methods: 30 patients are identified who were diagnosed with end stage arthritis of knee. Sampling based on inclusion and exclusion criteria. Included in study and all patients who underwent total knee arthroplasty either with tourniquet or without tourniquet between no January 2021 and June 2022 were retrospectively reviewed

RESULTS: Among 30 patients, 15 patients are operated with tourniquet and 15 patients are operated without tourniquet. This study showed average duration of surgery in tourniquet group is 89.4 min and in non tourniquet group is 101.2 min and p value is 0.0001. There is no other significant difference between two groups in terms post operative blood loss, post operative pain, function, serious adverse effects on 6 months follow up.

CONCLUSION: TKA performed with tourniquet and without tourniquet there is no significant difference in terms of blood loss, post operative knee pain, knee function and serious adverse effects. Tourniquet use in TKA to provide bloodless clear surgical field and thereby reduce operative time and cement adhesion to bone. Tourniquet use in TKA is based on surgeons preference, feasibility and their choice. But while applying tourniquet should be cautious and preoperative and post operative examination done to avoid further complications.

KEYWORDS: Total knee arthroplasty, total knee replacement, with tourniquet, without tourniquet

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I. Introduction:

Total knee arthroplasty (TKA) done for end stage arthritis of knee. Now a days Total knee arthroplasty commonly adopting procedure and evolving day to day life from past few years and advanced and much reliable option for end stage arthritis.

Tourniquet used in large number of routine orthopaedic operations including total knee arthroplasty (TKA) [1]. The major benefit of tourniquet in TKA is to provide bloodless surgical field, to reduce intraoperative bleeding, which result in improvement of cementation adhesion to bone there by improve implant fixation for a long duration and decrease duration of surgery.[2],[3]

Damage of soft tissue, thigh pain, nerve palsy, ischemia, thromboembolism, and poor wound healing are disadvantages associated with tourniquet use.[4][5]

TKA done without tourniquet has the obvious benefit of reducing the risk of all the complications as previously mentioned above with tourniquet use.

TKA done without tourniquet will be associated with increased blood loss which could effect on the surgical exposure, the cement adhesion to bone, and haemoglobin level.[6][7][8]

II. Materials And Methods:

30 patients are selected with end stage arthritis of knee. Sampling based on inclusion and exclusion criteria. Included in study and all patients who had gone TKA either with tourniquet or without tourniquet between no January 2021 and June 2022 were retrospectively reviewed

INCLUSION CRITERIA :

1. Age between 55 to 80 years
2. unilateral total knee arthroplasty
3. At least 6-months from TKA,
4. Not more than 5-years from TKA
5. Primary TKA with or without tourniquet use

EXCLUSION CRITERIA :

1. Lower extremities joint replacement other than knee
2. Any recent intra-articular injections or arthroscopic procedures on lower extremity joints.
3. Neurologic conditions (e.g. CVA, Parkinson's Disease), 4. major lower limb injuries, fractures and surgery
5. Any cardiovascular disease.

Patients were divided into two groups randomly and 15 patients are operated with tourniquet and another 15 patients operated without tourniquet. All the patients underwent cemented total knee arthroplasties under spinal anaesthesia

Surgical method was consistent in both groups. 4000u of enoxaparin was subcutaneously injected for routine anticoagulation started 12 hours before surgery and resumed 12 hours after surgery and followed by rivaroxaban 10 mg for 14 days.

If there was bleeding tendency, the anticoagulation was immediately stopped. Transfusion was given if Hb less than 10mg%. Duration of surgery calculated in minutes starting from incision to closure of wound. Hb measured at post op day 0, day 4 and post op day 12. Pain measured by visual analogue scale (VAS) of knee joint was measured at 1, 3, 14 days and 1 month after operation, and the score represented the degree of knee joint postoperative pain. Function measured by KSS(knee society score) measured at 3rd, 7th day, 1 month, 3rd month and 6th month. Serious adverse effects measure in terms of number of deaths, infection (joint or wound), venous thromboembolism (VTE), systemic embolic events, and re-operation

Student's t-test was used to evaluate the differences between the groups, using $p < 0.05$ as the cut-off for statistically significant differences.

III. RESULTS :

In terms of duration of surgery, there is a considerable significant difference between tourniquet group and non-tourniquet group. In tourniquet group average time is 89.4 min and range is from 85-100 min and non-tourniquet group average time is 101.2 min and range is from 95-110 min. There was a statically significant difference between two groups

In early postoperative days there is significant decrease in Hb levels between tourniquet group and without tourniquet. Significantly no difference in late postoperative days between two groups

Early post operative days in tourniquet group more pain experienced when both groups compared. On one month follow-up significantly no difference between two groups

On 6months follow -up there is no significant difference between with tourniquet and without tourniquet group in-terms of function.

Serious adverse effects measure in-terms of number of deaths, infection (joint or wound), VTE, systemic embolic events, and re-operation. No considerable serious adverse events occurred.

IV. DISCUSSION:

TKA is common operation procedure to treat and improve functional outcome in arthritis patients. TKA help in reduce knee pain and improve knee function in arthritis patients. TKA performed either with tourniquet or without tourniquet. In these study tourniquet group is compared with non-tourniquet group and findings are recorded and findings in study as follows.

In this study duration of surgery which is less in tourniquet group when compared to non-tourniquet group. The mean time in tourniquet group is 89.4 min and in non- tourniquet group is 101.2 min. Tourniquet provide blood less field and clear vision of anatomical structures and thereby reduce duration of surgery. Less blood in surgical field improve cement adherent to bone there by improve implant life and reduce loosening of implant . A study by Zhang et al. [9] said that tourniquet could reduce operation time. A study by Alcelik I et al. improved visualization of structures, reduced intraoperative bleed and better cementation [10].

Post operative Hb levels compared both tourniquet and non-tourniquet group to evaluate intraoperative and postoperative blood loss. In early postoperative days reduced mean difference of Hb levels in non tourniquet group when compared to tourniquet group. After 2weeks on evaluation mean difference Hb values in both groups there was no significant difference. A study by Tetro et al. reported reducing intraoperative blood loss by using tourniquet[11]. Another study by Caiet al. using of tourniquet can significantly reduce intraoperative blood loss[12]. Satoshi et al. found that change in Hb levels in early postoperative days in older age [13] group TKA performed with or without tourniquet. Previous study by Qi et al. reported Hb reached their lowest levels at post operative 4 and reached normal to with in 12 days postoperatively[14]. Jawhar et al. also reported reduced intraoperative bleeding with use of tourniquet but no difference in total bleeding volume[17]. Therefore in this is study early postoperative days Hb difference present but in late post operative days there is no clear difference between two groups.

When Literature is reviewed studies reported that patients who undergone TKA with tourniquet experienced more knee pain postoperatively and effect on post operative function when compared with non-tourniquet group. Alexander et al. reported no clear advantage of non-tourniquet in post operative recovery[15]. Mayer c et al. early post operative day patients experienced more pain in tourniquet group when compared with non-tourniquet group but after 1 month follow up no significant difference[16] . Similar out come showed by Lui Y et al. and Zhang et al. studies[18]. In these study when tourniquet group is compared with non-tourniquet group, early post operative days tourniquet group showed more pain score in comparison with non-tourniquet group and follow up at 2 weeks and 4weeks both groups showed no significant difference in pain. In terms of function follow up done upto 6 months ,there is no significant difference between two groups[20]. These study results are similar to results reviewed in literature.

Serious adverse effects measured in terms of number of deaths, infection (joint or wound), VTE, systemic embolic events, and re-operation[19]. Normally thromboembolic events occurred with TKA is 0.7-.9%. there is evidence in literature that tourniquet use associated with increased risk of thromboembolic events . But fewer studies supporting no significant difference between two groups. In 6 months follow up of this study showed no SAE and it needs further more follow up to evaluate the adverse effects.

When compared literature and meta analytical studies these study is limited ,sample size is small and short duration.

Surgery with tourniquet associated with post op pain ,difference may or may not be noticeable to patients. Surgery with tourniquet does not appear to confer any clinical meaningful benefit on function.

V. CONCLUSION:

TKA performed with tourniquet and without tourniquet there is no significant difference in terms of blood loss, post operative knee pain ,knee function and serious adverse effects. Tourniquet use in TKA to provide bloodless clear surgical field and thereby reduce operative time and cement adhesion to bone. Tourniquet use in TKA is based on surgeons preference , feasibility and their choice. But while applying tourniquet should be cautious and preoperative and post operative examination done to avoid further complications.

Limitations of the study: The sample size in our study was relatively small owing to a very low prevalence and less follow up period. Clinical studies showed there is no significant difference between two group in-terms post operative blood loss, function , serious adverse effect . It need further evaluation and follow-up.

REFERENCES :

- [1]. Wakankar HM, Nicholl JE, Koka R, D'Arcy JC. The tourniquet in TKA, a prospective randomized study. *J Bone Joint Surg Br* 1999; 81-B:30–33.
- [2]. Tetro AM, Rudan JF. The effects of a pneumatic tourniquet on blood loss in total knee arthroplasty. *Can J Surg* 2001;44(1):33-38.
- [3]. Tsarouhas A, Hantes ME, Tsougias G, et al. Tourniquet use does not affect rehabilitation, return to activities, and muscle damage after arthroscopic meniscectomy: a prospective randomized clinical study. *Arthroscopy* 2012;28(12):1812-1818.
- [4]. Vandenbussche E, Duranthon LD, Couturier M, et al. The effect of tourniquet use in total knee arthroplasty. *Int Orthop* 2002;26(5):306-309.
- [5]. Wakankar HM, Nicholl JE, Koka R, et al. The tourniquet in total knee arthroplasty. A prospective, randomised study. *J Bone Joint Surg (Br)* 1999;81(1):30-33.
- [6]. Rasmussen LE, Holm HA, Kristensen PW, et al. Tourni-quet time in total knee arthroplasty. *Knee* 2018; 25(2):306–313.
- [7]. Olivecrona C, Lapidus LJ, Benson L, Blomfeldt R. Tourniquet time affects postoperative complications after knee arthroplasty. *Int Orthop* 2013; 37:827–832.
- [8]. Richard E. Total knee arthroplasty without the use of tourniquet. *Semin Arthroplasty* 2011 22:176–178.
- [9]. Zhang W, Li N, Chen S, et al. The effects of a tourniquet used in total knee arthroplasty: a meta-analysis. *J OrthopSurg Res.* 2014;9(1):13
- [10]. Alcelik I, Pollock RD, Sukeik M, Bettany-Saltikov J, Armstrong PM, Fisser P. A comparison of outcomes with and without a tourniquet in total knee arthroplasty: a systematic review and metaanalysis of randomized controlled trials . *J Arthroplasty.* 2012;27(3):331–40
- [11]. Tetro AM, Rudan JF. The effects of a pneumatic tourniquet on blood loss in total knee arthroplasty. *Can J Surg* 2001;44(1):33-8
- [12]. Cai et al. The effects of tourniquet use on blood loss in primary total knee arthroplasty for patients with osteoarthritis: a meta-analysis *Journal of Orthopaedic Surgery and Research* (2019) 14:348
- [13]. Miyamoto, S.; Kosugi, M.; Sasaki, S.; Okazaki, K. Safety of Total Knee Arthroplasty without Using a Tourniquet in Elderly Patients. *Geriatrics* 2021, 6, 100.
- [14]. Zhou, Q.; Zhou, Y.; Wu, H.;Wu, Y.; Qian, Q.; Zhao, H.; Zhu, Y.; Fu, P. Changes of hemoglobin and hematocrit in elderly patients receiving lower joint arthroplasty without allogeneic blood transfusion. *Chin. Med. J.* 2015, 128, 75–78.
- [15]. Alexandersson, M.; Wang, E.Y.; Eriksson, S. A small difference in recovery between total knee arthroplasty with and without tourniquet use the first 3 months after surgery: A randomized controlled study. *Knee Surg. Sports Traumatol. Arthrosc.* 2019, 27, 1035–1042
- [16]. Mayer C,et al. Soft-tissue damage during total knee arthroplasty: Focus on tourniquet-induced metabolic and ionic muscle impairment. *J Orthop.* 2017;14(3):347–53.
- [17]. JawharA,et al. Tourniquet-induced ischaemia during total knee arthroplasty results in higher proteolytic activities within vastus medialis cells: a randomized clinical trial. *Knee Surg Sports TraumatolArthrosc.* 2016;24(10):3313–21.
- [18]. Zhang W, Li N, Chen S, Tan Y, Al-Aidaros M, Chen L. The effects of a tourniquet used in total knee arthroplasty: a meta-analysis. *J OrthopSurg Res.* 2014;9(1):13.
- [19]. Fukuda A, Hasegawa M, Kato K, et al. Effect of tourniquet application on deep vein thrombosis after total knee arthroplasty. *Arch Orthop Trauma Surg*2007;127:671.
- [20]. McCarthy Deering E, Hu SY, Abdulkarim A. Does tourniquet use in TKA increase postoperative pain? A systematic review and meta-analysis. *Clin OrthopRelat Res.* 2019 Mar;477(3):547-58.



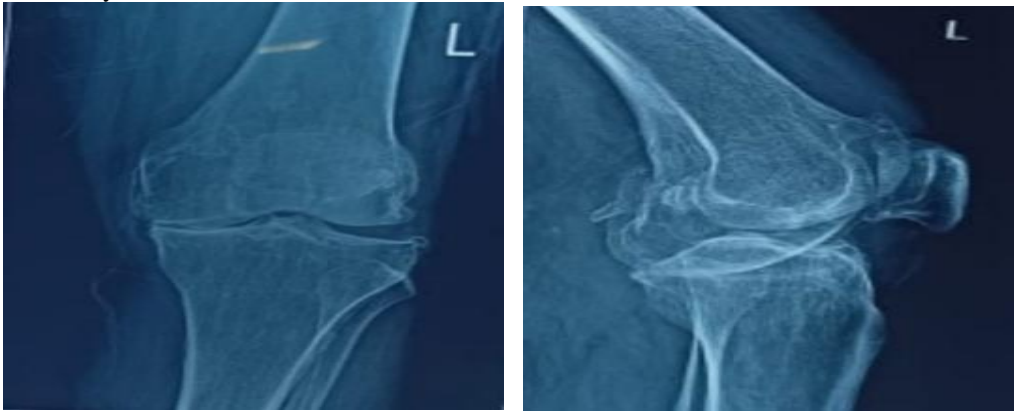
Tourniquet



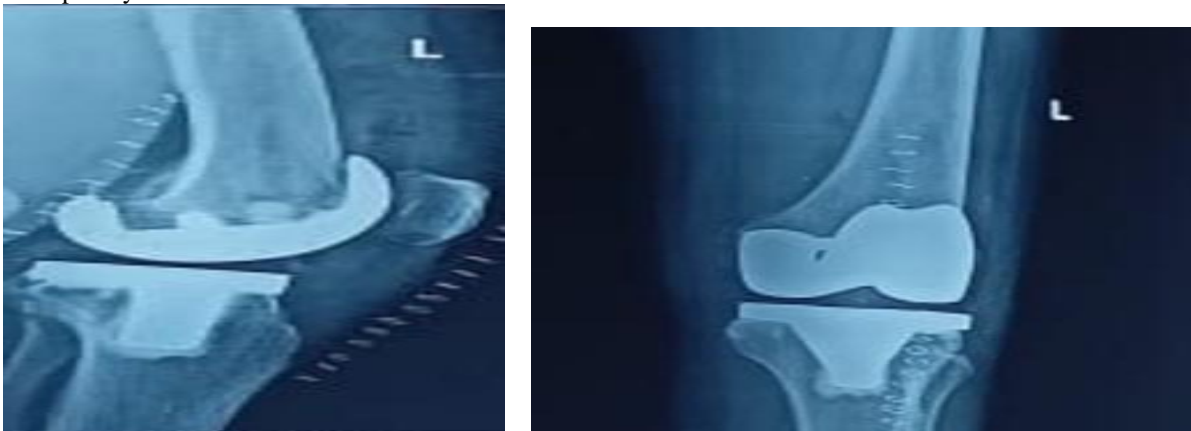
Automatic pneumatic tourniquet

Case 1 (with torniquet):

Pre operative x-ray



Post op x ray



Post operative knee function



Case 2 (without torniquet):

Preoperative and post operative x rays



Post operative knee function



ABBREVIATIONS:

- TKA - TOTAL KNEE ARTHROPLASTY
- ROM - RANGE OF MOTION
- VTE - VENOUS THROMBO EMBOLISM
- SAE - SERIOUS ADVERS EFFECTS
- VAS - VISUAL ANALOGUE SCALE
- HB - HAEMOGLOBIN
- KSS - KNEE SCOCIETY SCORE

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