

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: [www.elsevier.com/locate/apme](http://www.elsevier.com/locate/apme)

## Review Article

## Tourniquet during total knee arthroplasty: A review

Manish Kumar Tiwari, Raju Vaishya\*, Amit Kumar Agarwal, Vipul Vijay

Department of Orthopaedics, Indraprastha Apollo Hospitals, New Delhi, India

## ARTICLE INFO

## Article history:

Received 11 January 2017

Accepted 12 January 2017

Available online xxx

## Keywords:

Tourniquet

Total knee arthroplasty

Blood loss

Pain

Pros and cons

## 1. Introduction

Total knee arthroplasty (TKA) is one of the one of the commonest surgery being performed nowadays for disabling arthritis when nonsurgical treatment options are not helpful and insufficient. Although recent advances in surgical materials and techniques have increased the efficacy of the procedure, patients remain concerned about the pain and length of recovery associated with TKA. The use of tourniquets (Fig. 1) is a common practice amongst the surgeons as it seems to provide several benefits that can enhance procedural speed and patient recovery. It minimizes intra-operative blood loss, produces an intra-operative 'bloodless' visual field, improves the cement-bone inter-digitations and may reduce the operative time.<sup>1-3</sup> However, there are several disadvantages that may be associated with its use like post-operative swelling and stiffness, increased incidence of early infection and wound healing disorders due to perioperative hypoxia and reduced post-operative tissue perfusion, skin burns, increased risk of

nerve palsy & thrombo-embolism, and possible damage to the muscles and neurovascular structures.<sup>4-16</sup> The recent awareness about these complications has led many surgeons to minimize the use of a tourniquet during TKA. To establish the current status of the knowledge related to tourniquet use during TKA, we had reviewed the up to date literature and discuss the pros and cons of the utilization of a tourniquet in TKA.

## 2. Studies the favoring use of a tourniquet in TKA

A randomized study of 70 cases by Ezaj A et al.,<sup>17</sup> the patients in the non-tourniquet group showed a better outcome in all KOOS sub scores and better early knee ROM from surgery to week 8. No difference was detected at the 6- and 12-month follow-ups. Postoperative pain and analgesic consumption were less when a tourniquet was not used. Surgical time and visibility were similar between groups. Intra-operative blood loss was greater when not using a tourniquet, but no postoperative transfusions were required. Harsten A et al.<sup>18</sup> reported in a series of 64 cases that not using a thigh tourniquet during surgery was not superior in preserving knee-extension strength at the primary endpoint 48 h after fast-track TKA, compared to using a tourniquet. They also observed less bleeding during surgery (56 vs. 182 mL,  $P < .01$ ) with the use of tourniquet compared with the non-tourniquet group. There was no difference in postoperative hemoglobin levels, pain, nausea, LOS or peri-articular swelling between these two groups.

In a prospective study, Rathod et al.<sup>19</sup> compared clinical recovery in two groups of patients undergoing TKA based on differences in tourniquet strategy at the same institution. Group A (40 patients) consisted of TKAs performed by a surgeon using tourniquet from incision to arthrotomy closure,

\* Corresponding author at: Indraprastha Apollo Hospitals, New Delhi 110076, India.

E-mail address: [raju.vaishya@gmail.com](mailto:raju.vaishya@gmail.com) (R. Vaishya).<http://dx.doi.org/10.1016/j.apme.2017.01.005>

0976-0016/© 2017 Indraprastha Medical Corporation Ltd. All rights reserved.



**Fig. 1 – A high mid-thigh pneumatic tourniquet in place for total knee arthroplasty.**

and group B (40 patients) consisted of TKAs performed by another surgeon using tourniquet only during cementation. The surgical technique, implants, perioperative management, and patient demographics were similar between groups. Average tourniquet time was significantly higher in group A (71.7 min) as compared with group B (36.8 min). The maximum hemoglobin (Hb)/hematocrit (Hct) drop was statistically higher in group B (Hb drop =  $3.5 \pm 0.9$  g/dL; Hct drop =  $11 \pm 3$ ) as compared with group A (Hb drop =  $2.9 \pm 0.9$  g/dL; Hct drop =  $9 \pm 2$ ; Hb drop  $P = .01$ ; Hct drop  $P = .002$ ). There were no significant differences in visual analog scale pain scores, narcotic consumption, ability to straight leg raise during hospital stay, range of motion (ROM) at discharge, as well as isometric quadriceps strength, ROM, Short Form 36 scores, Knee Society scores at 6 weeks, 3 months, and 1 year follow-up with a similar multimodal pain management protocol. Radiographic analysis revealed no differences in cement penetration around the tibial component in any zone. Four patients developed a pulmonary embolism (three in group A, one in group B) and five patients underwent manipulation under anesthesia for stiffness (four in group A, one in group B). Thus, the use of a tourniquet only during cementing in TKA increases the hemoglobin drop and does not significantly influence pain or clinical recovery with available numbers, but was associated with a lower incidence of early complications. It is a learned surgical skill which significantly reduces tourniquet time and achieves a similar quality of cementing.

Mutlu et al.<sup>20</sup> in a retrospective analysis showed that the patients with tourniquets had significantly less intraoperative blood loss than patients without ( $P < .001$ ); patients without tourniquet required more blood transfusions ( $P = .551$ ), and had significantly longer surgical times ( $P = .011$ ). However, patients with tourniquets had more postoperative blood loss ( $P < .001$ ), longer hospital stays ( $P = .013$ ), and more frequent complications ( $P = .571$ ).

### 3. Studies against the use of a tourniquet in TKA

Dennish DA et al.<sup>21</sup> in a randomized control trial, assessed to determine whether tourniquet use affects recovery of quadriceps strength (primary outcome) during the first postoperative

months and to examine the effects of tourniquet application on secondary outcomes that is voluntary quadriceps activation, hamstring strength, unilateral limb balance as well as the effect on operative time and blood loss. Twenty-eight patients undergoing same-day bilateral TKA (56 lower extremities) were enrolled in a prospective, randomized study. Subjects were randomized to receive a tourniquet-assisted TKA on one lower extremity while the contralateral limb underwent TKA without extended tourniquet use. In the former group, the tourniquet was inflated just before the incision was made and released after cementation; in the latter group, a tourniquet was not used or inflated only during component cementation. The choice of no tourniquet or use just during cementation was based on surgeon choice, because some surgeons felt a tourniquet during cementation was necessary to achieve a dry surgical field to maximize cement fixation. A median parapatellar approach and the identical posterior-stabilized TKA design were used by all four fellowship-trained knee surgeons involved. Isometric quadriceps strength, hamstring strength, voluntary quadriceps activation, and unilateral balance were assessed preoperatively, three weeks, and three months after bilateral knee arthroplasty. Other factors, including pain, range of motion, and lower extremity girth, were assessed for descriptive purposes at each of these time points as well as on the second postoperative day. Quadriceps strength was slightly lower in the tourniquet group compared with the no-tourniquet group, and these differences persisted at three months after surgery. Hamstring strength did not differ between groups at any time point nor did measures of quadriceps.

A prospective case study was done by Tetro AM et al.<sup>22</sup> to assess the effects of a pneumatic tourniquet on blood loss in total knee arthroplasty. Sixty-three consecutive patients scheduled for primary cemented total knee arthroplasty (TKA) were blindly randomized into tourniquet ( $n = 33$ ) and non-tourniquet ( $n = 30$ ) groups and were assessed for perioperative blood loss, operating time, complication rates, hospital stay and transfusion needs. Results showed that differences in the total measured blood loss, intraoperative blood loss and the hemovac drainage blood loss between the two groups were not significantly different ( $P > .25$ ). The calculated total blood loss was lower in the non-tourniquet group ( $P = .02$ ). Between the groups, there were no statistical differences in surgical time, the length of hospital stay, transfusion requirements or rate of complications (although there was a trend to more complications in the tourniquet group ( $P = .06$ )). Moreover, the conclusion of the study was, the effectiveness of a pneumatic tourniquet to control blood loss in TKA is questionable.

### 4. Studies discussing the duration of tourniquet

A double-blind randomized control study was published by Wang K et al.<sup>23</sup> on fifty participants who underwent staged bilateral TKA were recruited for this study. The first-side TKA was randomly allocated to either long-duration tourniquet use or short-duration tourniquet use followed by a 3-month washout period and crossover of the other tourniquet strategy for the opposite-side TKA. Blood loss was monitored peri-operatively. The operating time, allogeneic blood

Download English Version:

<https://daneshyari.com/en/article/8718244>

Download Persian Version:

<https://daneshyari.com/article/8718244>

[Daneshyari.com](https://daneshyari.com)