



Isolated iatrogenic lesions of the popliteus tendon during total knee arthroplasty

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Abstract

The aim of this literature review was to determine the impact of an isolated iatrogenic lesion of the popliteus tendon during total knee arthroplasty surgery on the stability and function of the knee. We did a bibliographic search on "PubMed", and "Cochrane". Two reviewers independently screened the title and abstract of each article using predetermined eligibility criteria. A total of 157 articles were found. After eliminating duplicates, and articles that did not satisfy the selection criteria, four articles were selected.

The four articles selected were distributed as follows: Two retrospective studies, one retrospective study combined with a cadaveric study, and one blinded randomized clinical trial combined with a cadaveric study. Finally, we concluded that the isolated section of the popliteus tendon does not seem to modify the static stability of the knee. However, it can cause a decrease in long-term functional scores. More work is needed to better understand the impact of iatrogenic lesions of the popliteus tendon during total knee arthroplasty on knee stability and long-term function.

I- INTRODUCTION

The popliteus tendon (PT) is known to have an important role in the stability of the postero-lateral corner of the knee. Its role in the stability of the total knee arthroplasty (TKA) is still controversial. Iatrogenic injury of the PT during TKA is an intraoperative incident that has been little studied in the literature. Its frequency is very variable: from 2.2%^[1] no studies have evaluated the effect of iatrogenic popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1 to 52%^[2]). The functional consequences of this incident have not yet been elucidated. Our aim was to determine the repercussions of an iatrogenic lesion of the PT during TKA with genu-varus, on the stability and on the function of the knee.

II- METHODS:

A- Data sources and search strategy:

A comprehensive literature search was undertaken via two key databases: MEDLINE, and Cochrane Library for all years. Two reviewers independently screened the title and abstract of each article using predetermined eligibility criteria (see below). Discrepancies were resolved via discussion and consensus. The electronic search was complemented by searching manually the reference lists of the articles found.

B- Eligibility criteria:

We included in our search all articles that studied the functional impact of isolated iatrogenic traumatic lesions of the PT during TKA with genu-varus. We didn't included articles that studied TKA with genu-valgus. We excluded articles that studied non-traumatic lesions of the PT, related to dysfunctions caused by impingements of the PT with bony or prosthetic structures. we excluded articles that report PT injuries associated with others ligament or tendon injuries of the knee during TKA. We excluded also cadaveric studies.

Full text copies were retrieved for articles that were not excluded based on the title and abstract, and eligibility criteria were applied by the same reviewers.

III- RESULTS:

A total of 157 articles were found in the electronic database search (Figure 1). After removing duplicates, screening all titles and abstracts, 11 publications were assessed in full. After removing a further 7 publications that did not satisfy the selection criteria, only four publications were included (Figure 1).

Figure 1: A flowchart of the search strategy used in this review.

The four articles selected were distributed as follows: one blinded randomized clinical trial combined with a cadaveric study (evidence level at 2)^[3], two retrospective studies^[1,2] no studies have evaluated the effect of iatrogenic

popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1, and one retrospective study combined with a cadaveric study (evidence level at 3)^[4].

Among these studies, one article compared the Prevalence of popliteus tendon injuries between conventional and high-flex TKA^[4], two studies worked on postero-stabilized TKA (PS)^[1,3] no studies have evaluated the effect of iatrogenic popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1, and one study^[2] worked on heterogeneous series including postero-stabilized TKA and TKA retaining the posterior cruciate ligament (PCL). The results of these studies were summarized in Table I.

Table I: Characteristics of included studies

Authors	Type of study	Evidence Level	Number of cases	Conclusion
Apinyankul (2020)	Retrospective study + Cadaveric study	III	Phase 1 (Clinical study) 132 patients: 87 conventional design TKAs / 45 high-flex design TKAs. Phase 2: cadaveric study (18 cadavers were dissected to reveal 36 PT origin sites).	High-flex TKA prosthesis with thicker posterior condyle relates to higher possibility of PT origin injury compared to standard one.
Aki (2016)	Retrospective case-control study	III	275 TKA: 200 with PCL conserved/ 75 PS	Partial or total excision of the PT femoral footprint was identified in 52% of the knees. Risk Factors: Thick resection of the distal femoral condyle and small knees.
Vito de Simone (2012)	Retrospective comparative study	III	15 TKA PS with iatrogenic section of PT / 666 TKA with intact PT.	An iatrogenic section of the PT leads to a decrease in the IKS scores after 2 to 3 years. Risk factors: Small knees.
Kesman (2011)	Randomized blind trial + cadaveric study	II	18 TKA PS randomized into 2 groups. + 3 cadaverous knees	The section of the PT has no effect on the stability of the knee.

TKA: total knee replacement; PCL: posterior cruciate ligament; PS: postero-stabilized; PT: popliteal tendon; IKS: International Knee Society

IV- DISCUSSION

Iatrogenic injury of the popliteus tendon (PT) during total knee arthroplasty (TKA) is an intraoperative incident that has been little studied in the literature. Its frequency is very variable, and we think that it is under estimated.

There are two types of iatrogenic lesions of PT during TKA: partial or total iatrogenic transection of the tendon and partial or total resection of its footprint.

Total intraoperative iatrogenic transection of PT was reported in 15 cases among 681 TKA (2.2 %) in the series of De Simone and al^[1] no studies have evaluated the effect of iatrogenic popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1. Aki and al^[2] found that partial or complete resection of the PT femoral footprint was identified in 52% of TKA.

A- Risk factors:

Risk factors for excision of the PT femoral footprint included: female gender and a reduced anteroposterior knee diameter, according to Takahashi and al^[5], as well as thick resection of the distal femoral condyle and short stature of the patient according to Aki^[2] and Apinyankul^[4].

Apinyankul and al^[4], demonstrated that High-flex TKA prosthesis with thicker posterior condyle relates to higher possibility of popliteal tendon origin injury compared to standard one. According to the cadaveric study by Takahashi and al^[5], for some TKA designs, the femoral footprint of PT can inevitably be excised, regardless of technical problems. According to this study, the LCS system (low contact stress) seemed to preserve the insertion of PT.

Risk factors of iatrogenic section of the PT included small knees^[1] no studies have evaluated the effect of iatrogenic popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1 and a shorter distance between the PT and the distal articular surface of the femur^[6]. According to Herregodts^[7] the motion of the oscillating saw with respect to the tibia was recorded. The distance of the outer point of this cutting portion to the edge of the bone was defined as the excursion of the oscillating saw. The excursion of the sawblade was evaluated in six zones containing the following structures: medial collateral ligament (MCL, the risk of PT injury by the oscillating saw is related to the skill level of the surgeon.

B- Effect of PT injury on knee stability after TKA:

The effect of PT injury on knee stability during TKA was studied in only one single article: the randomized blind trial of Kesman and al^[3].

Kesman and al^[3] did not document any difference in the subjective stability of the knee after section of the PT during postero-stabilized TKA. Kesman and al^[3] also carried out a cadaveric study on three knees. There was no change in the distribution of charges between the medial and lateral tibial plateau after the PT section when the knee is near the extension. Finally, they concluded that the PT section had no effect on the stability of the knee during TKA. However, they did not assess the effect of the PT section on the knee in flexion.

In agreement with the conclusion of Kesman and al^[3], some cadaver studies concluded also that there was no effect on static knee stability after PT section, in both postero-stabilized TKAs^[8,9] and TKAs retaining the PCL^[10]. According to Kanamya and al^[8], a significant effect was noted only when the other postero-lateral structures were sectioned. For Ghosh and al^[9], above 90 ° of flexion, the laxity increases significantly.

C- Effect of iatrogenic lesions of PT on knee function:

The effect of iatrogenic lesions of PT on knee function was studied in a single article published by De Simone and al^[1] no studies have evaluated the effect of iatrogenic

popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1. The author carried out a retrospective study which compared between the functional result of 15 patients having an iatrogenic section of PT and the functional result of 666 patients having intact PT. All TKAs were postero-stabilized. No effort has been made to repair the PT. De Simone and al^[1] no studies have evaluated the effect of iatrogenic popliteal tendon injury on patient oriented outcome and knee function following TKA. The aims of this study are (1 concluded that a complete intraoperative section of PT resulted in a decrease in IKS (International Knee Society) functional scores after two to three years postoperatively.

D- Strengths and limitations of this review :

In this review, two of the co-authors were responsible for identifying relevant studies, extracting the data, appraising the quality of the evidence and synthesising the findings. This is a clear strength of the review, but, there are limitations that warrant consideration. First, only one RCT was included for evaluation. The included RCT, which was rated as high quality (Level 2), did not assess the effect of the PT section on the knee in flexion. This review does highlight the need of more evidence-based research in this subject.

V- CONCLUSION

During total knee arthroplasty, two types of iatrogenic lesions of the PT can be seen: partial or total transection of the tendon and partial or total resection of its footprint. The risk factors for iatrogenic lesions of PT mentioned in the literature are: female gender, small knees and thicker resection of the external femoral condyle. The isolated section of the PT does not seem to affect the static stability of the knee after TKA. However, it can cause a decrease in long-term functional scores. More work is needed to better understand the repercussions of iatrogenic lesions of PT during TKA on the stability of the knee and its function.

VI- REFERENCES

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