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CURRENT CONCEPTS REVIEW

Does a Previous High Tibial Osteotomy (HTO) Influence the Long-term Function or Survival of a Total Knee Arthroplasty (TKA)?

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Received: 09 January 2016 *Accepted: 13 June 2017*

Abstract

High tibial osteotomy (HTO) is a well established technique for the treatment of medial osteoarthritis of the knee with varus malalignment. The outcome of total knee arthroplasty (TKA) after HTO remains uncertain.
The aim of this paper is to revise the literature with the aim of answering the following question: Does a previous (HTO) influence the long-term function or survival of a TKA?.
The search engine was MedLine. The keywords used were: total knee arthroplasty after high tibial osteotomy. One hundred and ten articles were found. Of those, only 19 were selected and reviewed because they were strictly focused on the topic and the question of this article.
The reports published so far have a low grade of evidence (levels III and IV). Most of them are prospective case series (level IV). One is a systematic review of level III studies reported in 2009. Two recent studies based in a great number of cases (registers) showed similar survival in the 2 groups: around 92% at 10 years, and 88% at 15 years.
The review of the literature suggests that a previous HTO does not influence the function or survival of a TKA in the long-term.

Level of evidence: III

Keywords: Function, Previous high tibial osteotomy, Results, Survival, Total knee arthroplasty

Introduction

High tibial osteotomy (HTO) is a well known surgical technique for the treatment of medial osteoarthritis of the knee with varus malalignment. The outcome of total knee arthroplasty (TKA) after HTO remains uncertain (1-12).

The purpose of this article is to revise the MedLine literature with the aim of answering the following question: Does a previous (HTO) influence the long-term function or survival of a TKA?

Materials and Methods

A review has been performed on the results of TKA after HTO. The search engine was MedLine (PubMed). The keywords used were: total knee arthroplasty after high tibial osteotomy. One hundred and ten articles were found. Of those, only 19 were selected and reviewed because they were fully focused on the subject and the question of this article.

Results

The types of studies reported have a low level of evidence (levels III and IV). Of the 12 papers published before 2009, 9 found no different results when compared the outcomes of TKA with previous HTO and TKA without previous HTO (1-9). However, 3 studies found different results (10-12). Most of them are prospective case series

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(level IV), although one of them is a systematic review of level III studies reported in 2009 (13). This systematic review did not find differences between TKA with previous HTO and TKA without previous HTO (13). In other words, HTO did not compromise subsequent TKA.

After 2009, 6 papers have been found on the topic, but only one encountered different results (14). The rest of reports found no differences (15-19). Two recent reports based in a great number of cases (registers) showed similar survival in the 2 groups: around 92% at 10 years, and 88% at 15 years (18, 19).

Niinimäki et al analyzed a registry-based case-control study of 1,036 TKAs after HTOs (18). In the Kaplan-Meier survivorship analysis they found rates of 95.3% at 5 years, 91.8% at 10 years, and 88.4% at 15 years. The survivorship rates were lower than those of patients who underwent TKA without previous HTO (97.2, 94.5, and 90.6%, respectively). Thus, in spite of the slightly higher revision rate, TKA after HTO yielded satisfactory results when compared to TKA without previous HTO (18).

Badawy et al evaluated the risk of revision of TKA with or without previous HTO (19). They compared primary TKAs with TKAs after HTO, using Kaplan-Meier 10-year survival rates and adjusted Cox regression analysis. The survival rate was similar in the 2 groups: 93.8% in the primary TKA group and 92.6% in the TKA-post-HTO group. Table 1 summarizes main data and results of papers published after 2009.

Table 1. Main data and results in the literature after 2009. TKA=Total Knee Arthroplasty; HTO=High Tibial Osteotomy; NA=Not available

Author (year) (Ref)	Nº of TKAs with HTO	Nº of TKAs without HTO	Mean FU	Parameters assessed	Results	Conclusions
Amendola (2010) (15)	29	29	7.9 years	NA	Results for the HTO group were satisfactory in 96.5% of cases. In one patient loosening of the TKA occurred after 37 months, which required prosthesis revision. Three patients underwent a further operation of secondary patella resurfacing for patella pain.	The group without HTO reported a similar percentage of satisfactory results.
Efe (2010) (16)	41	41	6 years minimum	Clinical outcome was assessed using a number of clinical scores and the visual analogue scale for pain. X-rays were evaluated by the method of the American Knee Society. The patellar position was measured by the Insall-Salvati ratio.	There was no significant difference in mean operation time and complication rate. The Knee Score of the KSS and the ROM for extension and for flexion were significantly better in the control group. Mid-term results of the VAS, WOMAC, Lequesne, UCLA, Feller's Patellar Score and SF-36 showed no significant difference. Femoral and tibial component alignmentwere similar in both groups. One tibial component showed suspect radiolucencies in the HTO group. The Insall-Salvati ratio showed three patients with patella alta and one patient with patella baja in the HTO group. At latest follow-up all implants were still in place.	Evaluating the clinical and radiological outcome, significant differences were only detected for range of motion and the Knee Score of the KSS. This study suggested that the results of TKA with and without prior HTO were mainly identical. Although patients with a previous HTO had more complications, no statistically significant differences were noted with this group size.
Erak (2011) (14)	34	1315	3.4 years	Knee Society score and pain score	The authors encountered patella baja in 27% of cases, and an increased posterior tibial slope of over 15° in 21%. There was a lower Knee Society score and a lower pain score (more pain) in the study group compared to the control group.	TKA following HTO in this study group yielded inferior clinical results compared to a group of TKAs performed without prior HTO.

Continuous of Table 1.

Meding (2011) (17)	39	5004	14 years	Knee Society scores	The authors observed no differences in Knee Society function and radiographic and pain scores between the knees without and with previous HTO. Terminal extension and flexion, arc of motion, and knee alignment were similar between the knees. There were no femorotibial revisions in either group of knees. Survival at 15 years was 100% for knees without previous HTO and 97% for knees with previous HTO.	This study suggested that a previous HTO does not influence the function or survival of a TKA long term.
Niinimaki (2014) (18)	1036	4343	6.7 years	Kaplan-Meier survivorship using the Finnish Arthroplasty Register and the National Hospital Discharge Register.	In the TKA after HTO group, the authors found Kaplan-Meier survivorship to be 95.3% at 5 years, 91.8% at 10 years, and 88.4% at 15 years. Those survivorship values were lower than those of patients who had TKA without previous HTO (97.2, 94.5, and 90.6%, respectively).	This study supported previous research, and despite the slightly higher revision rate, TKA after HTO provided satisfactory results when compared to routine primary TKAs.
Badawy (2015) (19)	1399	31077	NA	The authors evaluated the risk of revision of TKA with or without previous HTO in a large registry material using Kaplan-Meier 10-year survival percentages and adjusted Cox regression analysis.	The adjusted survival analyses showed similar survival in the 2 groups. The Kaplan-Meier 10-year survival was 93.8% in the primary TKA group and 92.6% in the TKA-post-HTO group.	In this registry-based study, previous HTO did not appear to compromise the results regarding risk of revision after TKA compared to primary TKA.

Discussion

The purpose of this article was to review the literature with the aim of answering the following question: Does a previous (HTO) influence the long-term function or survival of a TKA?

The quality of reports published so far on the topic is poor (low level of evidence, levels III and IV) (1-12, 14-19). Only one is a systematic review of level III studies published in 2009 (13).

The only systematic review reported on the topic in 2009 and the majority of papers (one out of six) reported after 2009 found no differences between the long-term function or survival of a TKA after HTO vs. long-term function or survival of a TKA without a previous HTO. Two recent studies based in a great number of cases (registers) showed similar survival in the 2 groups: around 92% at 10 years, and 88% at 15 years.

In conclusion, the review of the literature suggests that a previous HTO does not influence the function or survival of a TKA in the long-term.

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