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REVIEW ARTICLE

Total Ankle Replacement in Hemophilia

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ARTICLE HISTORY

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Abstract: ***Introduction*:** Severe ankle hemophilic arthropathy can be a calamitous sign of severe hemophilia with important inferences for activities of daily living.

***Aims*:** To summarize the contemporary, accessible information on Total Ankle Replacement (TAR) for ankle hemophilic arthropathy.

***Methods*:** A search of Cochrane Library and PubMed (MEDLINE) regarding the role of TAR in ankle hemophilic arthropathy.

***Results*:** The insufficient information regarding the results of TAR for hemophilic arthropathy is confined to scanty case series and case reports. An evaluation of the accessible literature reveals encouraging but inconstant outcomes. The reported rate of adverse events is 33%. The reported anticipated survival of TAR is 94% at 5 years, 85% at 10 years and 70% at 15 years.

***Conclusion*:** Whereas people with advanced hemophilic arthropathy of the ankle are prone to ameliorate pain and range of motion following TAR, there is deficient knowledge to regularly recommend its use. Adverse events and infection percentages are disturbing. Moreover, the lack of survival analysis knowledge makes it difficult to assess the benefit to people with hemophilia. TAR is a demanding surgical procedure and its survival is not comparable to that after hip or knee replacement.

Keywords: Hemophilia, hemophilic arthropathy, ankle, total ankle replacement, hemarthrosis, rheumatoid arthritis.

1. INTRODUCTION

Hemophilia is an X-linked recessive bleeding sickness produced by a clotting factor insufficiency. Factors VIII (deficient in hemophilia A) and IX (deficient in hemophilia B) are clotting cascade intermediaries essential to the generation of cross-linked fibrin, the firm meshwork that ensures a clot. Severe hemophilia is depicted by musculoskeletal bleeding, most prominently repetitive hemarthrosis [1].

When conservative treatment goes amiss to procure enough alleviation, more invasive therapies may be recommended [2]. All therapies should be carried out under hematological coverage, and they are particularly perilous in people with inhibitors (antibodies opposite to the deficient coagulation factor) [3-6].

For people with a restricted range of motion in whom other therapeutic alternatives have been inefficient, particularly in those with considerable pain and no many physical demands, Total Ankle Replacement (TAR) is an alternative [6]. A review of the literature shows a paucity of information, with reports confined to case reports and small case series.

TAR is much less frequent than hip and knee arthroplasties, but it has an augmented reputation lately [7, 8]. TAR has been delineated as one of the most demanding joint arthroplasties [9].

The most frequent indications for TAR are rheumatoid arthritis and degenerative osteoarthritis [10, 11]. With the perceptible success of TAR in people with rheumatoid arthritis and osteoarthritis, orthopedic surgeons have more lately expanded its use to incorporate severe ankle hemophilic arthropathy [9, 12].

The goal of this paper is to summarize the currently accessible information on TAR for hemophilic arthropathy of the ankle.

2. METHODS

A Cochrane Library and PubMed (MEDLINE) search related to TAR was carried out and analyzed. The principal criteria for selection were articles that were focused on the role of TAR in hemophilia. The decision to include or to exclude a paper was made by only one person (the author of the article). A librarian was not involved in the literature search. The explorations were dated from November 2006

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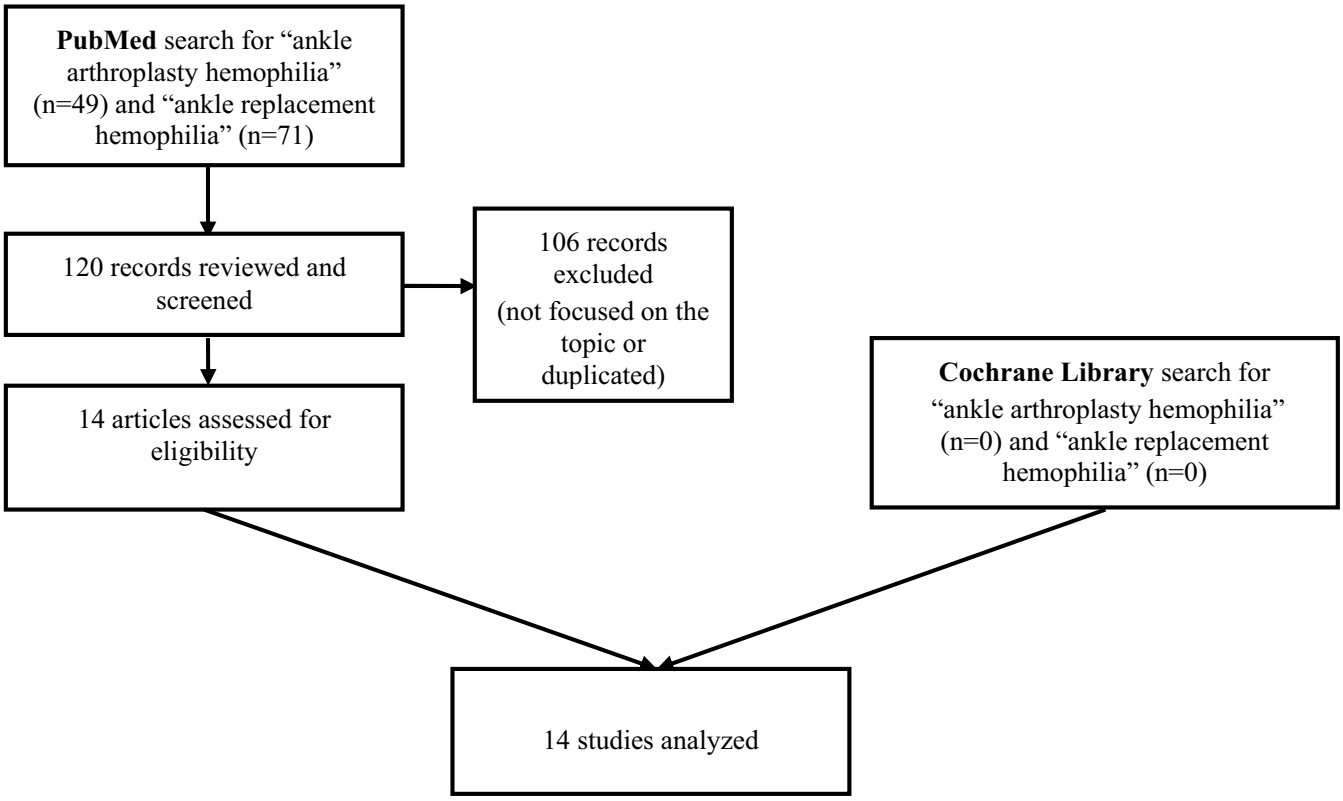

Fig. (1). Flow chart of our search strategy regarding the role of Total Ankle Replacement (TAR) in hemophilia (17 October 2018).

when the first paper on the topic was reported (PubMed and Cochrane Library) until 17 October 2018. The search items that we utilized are summarized in Fig. (**1**). In total, 14 references were acquired and served as the database for the literature revised in this article.

3. RESULTS

There is scarce information accessible, debating the use of TAR in hemophilic arthropathy of the ankle [13-24]. More information exists regarding knee and hip replacements in connection with people with hemophilia, as these surgical techniques have been more usual for a number of decades. Table **1** summarizes the main conclusions and level of evidence of papers reported so far on TAR in hemophilia.

4. DISCUSSION

A number of conservative alternatives are accessible to manage ankle problems in hemophilia, which in most cases, produce a high percentage of satisfactory outcomes [5]. They include patellar tendon bearing orthosis and radiosynovectomy [8]. If conservative alternatives are unsuccessful, several surgical alternatives are accessible: Arthroscopic ankle debridement, resection of osteophytes of the anterior part of the distal tibia, tibio-talar fusion (ankle arthrodesis) and TAR. Tibio-talar fusion is the most commonly used technique for advanced hemophilic arthropathy of the ankle [25-27].

In people with hemophilic arthropathy, arthroscopic ankle debridement can give temporary alleviation; however, patients must know that that the grade of amelioration is limited. Orthopedic procedures are not very common in hemophilic arthropathy of ankle, because most problems can be improved sufficiently by conservative therapies (radiosynovectomy and patellar tendon bearing orthosis) [3-6].

In 2015, it was reported that arthroscopic ankle debridement should be indicated in the young hemophilic patient to defer tibio-talar fusion or TAR. The procedure may diminish the intensity of pain for many years [4].

TAR in patients without hemophilia gives quite variable results, and complications are frequent. Although some successful series have been published showing a range of motion amelioration, pain improvement and functional amelioration in a high rate of patients, the frequency of adverse events and revisions, and the percentage of infection were not so satisfying [2, 9, 12-21, 23, 24].

In people with hemophilia, ankle surgery should be scaled adequately. Management must be directed to the individual patient's situation, complaints and objectives. If there is pain and synovitis but only limited articular destruction, ankle radiosynovectomy or arthroscopic ankle debridement may instead be advised.

TAR, however, should be taken into account for only those patients with intense pain unresponsive to the aforementioned less invasive surgical alternatives, and wide articular destruction.

The ideal management for hemophilic ankle arthropathy when hematologic prophylaxis fails includes physical medicine and rehabilitation (physiotherapy, orthoses, *etc*.),

Table 1. Main data of papers reported so far on total ankle replacement (TAR) in hemophilia.

Authors [Ref]	Year	Type of Study	Level of Evidence	Results and Conclusion
Van der Heide *et al.* [13]	2006	Case Series	Low	These authors analyzed 5 TARs (three patients). After a mean follow-up of 4 years all TAR were still in place.
Scholz and Scholz [12]	2008	Review Article	Low	These authors stated that TAR can be a successful treatment in people with hemophilia under certain conditions.
Min *et al.* [14]	2009	Case Series	Low	These authors reported six hemophilic patients with tibio-talar hemophilic arthropathy, with an average of 41 years, who underwent TAR in a 3-year period, with satisfactory results.
Berdel *et al.* [15]	2009	Case Report	Low	These authors reported the case of a 52-year-old man, suffering from severe hemophilia A, without inhibitor formation. TAR was implanted with satisfactory result at 3 months.
Barg *et al.* [16]	2010	Case Series	Low	These authors reported ten TARs implanted in eight patients (mean age: 43 years), with satisfactory results. Minimal follow-up was 2.7 years. There were no intra- or peri-operative complications. One patient required open tibio-talar arthrolysis because of painful ankle stiffness.
Strauss *et al.* [17]	2014	Case Series	Low	Outcomes after eleven TARs in 10 patients with severe and moderate hemophilia (mean age: 49 years) were assessed at a mean follow-up of 3 years. The results were satisfactory.
Asencio *et al.* [18]	2014	Case Series	Low	These authors analyzed 21 hemophilic patients who underwent 32 TARs, with additional surgery, if needed, in a 7-year period (mean follow-up 4.5 years). Two patients required further tibio-talar fusion. The rest of patients had satisfactory results.
Barg *et al.* [19]	2015	Case Series	Low	These authors reported eighteen patients with von Willebrand disease who underwent TAR. Their mean age was 47. The mean duration of follow-up was 7.5 years. One patient had an intra-operative medial malleolar fracture. In two patients delayed wound healing was observed. Two secondary major surgeries were required. Mid-run outcomes of TAR in patients with von Willebrand disease were encouraging. However, the total rate of adverse events was 33%.
Barg *et al.* [20]	2015	Case Series	Low	These authors reported 34 hemophilic patients who underwent TAR with satisfactory results. Their mean age was 46 years. One patient had an intraoperative medial malleolar fracture. In total, three revision surgeries were necessary in this series.
Yilmaz *et al.* [21]	2015	Case Report	Low	These authors reported a 29-year-old male patient with hemophilia, who underwent TAR. At 2 years, the result was excellent.
Dauty *et al.* [22]	2015	Two Case Report	Low	These authors compared TAR and tibio-talar fusion in two patients with hemophilia using gait analysis.
Preis *et al.* [23]	2017	Case Series	Low	These authors analyzed fourteen patients with a mean age of 51 years. Nine procedures were primary TARs, while five procedures were conversions of painful tibio-talar fusions to TAR. The mean duration of follow-up was 6 years. One patient had an intraoperative medial malleolar fracture. In two patients, delayed wound healing was found. In one patient, open arthrolysis was carried out due to painful ankle stiffness. The percentages of adverse events and clinical/radiographic results were comparable in patients with primary TAR and conversion of tibio-talar fusion to TAR.
Solimeno and Pasta [9]	2017	Review Article	Low	These authors stated that the use of TAR is still a controversial issue and that the introduction of novel implant designs and more favorable reported outcomes have revived the interest in TAR in people with hemophilia.
Eckers *et al.* [24]	2018	Case Series	Low	These authors analyzed 12 TARs in hemophilic patients (mean age: 43 years; mean follow-up: 9.5 years). Implant survival was predicted using Kaplan-Meier analysis. Predicted prosthetic survival was 94% at 5 years, 85% at 10 years and 70% at 15 years. Three patients required revision surgery.

radiosynovectomy, arthroscopic ankle debridement (in the early stages of cartilage destruction), tibio-talar distraction, and tibio-talar fusion or TAR (in advanced stages of cartilage degeneration) [7, 8].

It has recently been published by Rodriguez-Merchan and Moracia-Ochagavia that TAR offers a rational option to tibio-talar fusion in meticulously selected patients with osteoarthritis. Aseptic loosening and infection are the most common complications requiring revision. In patients with osteoarthritis, the 15-year survival of primary TAR ranges from 45% to 91%. Revision TAR has a 10-year survival of 55%, which is lower than the 10-year survival of 74% for primary TAR reported. TAR is a demanding surgical technique and in patients with osteoarthritis, the survival is not comparable to that after hip or knee replacement [28].

CONCLUSION

TAR may improve pain and range of motion in ankle hemophilic arthropathy. However, the rate of adverse events is high and the length of survival of the implant is not well-know yet. Therefore, there is insufficient knowledge to routinely advise its use. Prior to proceeding with TAR, a thorough discussion with the patient about the dangers and benefits is required.

CONSENT FOR PUBLICATION

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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