Research Article

Tibial Distal Osteotomy in Valgus Ankle in Patients with Hemophilia

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Abstract

Introduction: Hemophilic ankle arthropathy is the result of recurrent bleeding. Arthropathy reduces joint movement, causes chronic pain, restricts normal activity, causes depressive episodes, and diminishes quality of life.

Objective: The aim of the present work is to present our surgical technique for supramalleolar metaphysis osteotomy in haemophilic arthropathy with valgus deformity.

Material and Method: Seven patients with Haemophilia A were treated with metaphyseal supramalleolar osteotomy. The mean age was 14 years. The mean follow up was 8 years. Osteotomies were performed in patients with joint line valgus deformity and pain. The mean angle of deformity of the joint, was 16º degrees. All patients had haemophilic arthropathy of the ankle. Preoperative planning medial wedge was calculated according to the degrees of deviation to be corrected.

Results: In all patients, the joint line improved the mean was 1° and mean VAS 2. All patients showed signs of consolidation at 6 weeks. No patients had wound complications. It was not necessary to remove the osteosynthesis.

Discussion: Ankle arthropathy is frequent in PWH. Synovitis must be rapidly treated, because repetitive bleeding produces cartilage damage. Joint malalignment and arthropathy are part of the same pathology, occurring after chronic synovitis. Medial supramalleolar tibial osteotomies with lateral corticotomies increase stability. The percentage of consolidation was 100%. Preoperative planning and the wedge resection were effective. Joint movement was related to the patient’s grade of arthropathy.

Conclusion: Good clinical and radiologic evaluation and expertise in recognition of pain in ankle arthropathy in PWH allow surgeons to choose the treatment method.

ABBREVIATIONS

PWH: Patients with Hemophilia; VAS: Visual Analogue Scale; ROM: Range of Motion

INTRODUCTION

Hemophilic ankle arthropathy is the result of recurrent bleeding episodes in the joint. Arthropathy reduces joint movement, causes chronic pain which usually requires pain killers, restricts normal activity such as school or work, causes depressive episodes, and most importantly, diminishes quality of life [1]. The ankle is, however prone to repeated hemorrhage from a much earlier age than other joints, as soon as a child begins to crawl and then walk [2,3]. An indication for surgery in hemophilic patients is persistent bleeding requiring high rate of concentrate administration. Wallny et al., reported that in haemophilic arthropathy the joint that most often causes pain is the ankle 45.1 % followed by the knee 39.4 % [4].

Ankle pain patients with Haemophilia (PWH) can be due to four different mechanisms. The first mechanism is of anterior osteophyte related to mechanical pain. The bone impingement is caused by the impact of the tibial osteophyte with the astragalus, which causes decreased range of motion, pain and feet in equine position. Patient suffers anterior ankle pain which is worse with forced flexion underweight load. When the patient is standing on tiptoes, the pain increases. The doctor can also check for anterior mechanical pain by forcing flexion of the ankle with the patient lying on the examination table in supine decubitus. The joint line may or may not be narrowed.

The second mechanism which causes pain is the central osteophyte which is the typical form of arthropathy and causes chronic pain and diminished quality of life in PWH. The symptoms are generalized joint pain with movement restriction and narrowed joint line.

The third and fourth mechanisms are related to the persistence of synovitis that leads to metaphyseal regional osteopenia with the increase of vascularity in the medial
region of the distal tibia. This causes an enlargement of the metaphyseal region with progressive valgus deformity [2,5]. This results in two types of pain. One is medial pain in the ankle which is produced by the marginal osteophyte. This medial osteophyte is due to overgrowing of the tibial malleolus, and may produce an entrapment of the tibial tendons and the tibial nerve. In 1990, Pottinger and colleagues found that in uni-compartmental osteoarthritis of the knee, marginal osteophytes appear to stabilize osteoarthritic joints, but can cause fixed deformity [6]. In a very small number of patients, the joint surface is in varus due to the metaphyseal overgrowth, and the ankle also adopts the varus position Figure 1. The fourth pain mechanism is lateral pain in the ankle produced when the joint line is in valgus, generating an overload in the external compartment. The ankle is in valgus and load-bearing while standing on one foot exacerbates pain. We did not find descriptions of these four pain mechanisms in haemophilic ankle arthropathy in the literature. This classification helps the surgeon understand and define treatment. In patients with anterior and medial pain, arthroscopic resection of osteophytes is recommended. In generalized arthropathy, joint replacement or arthrodesis are treatment options most often used by hemophilic orthopaedic surgeons.

Finally, when lateral pain is due to malalignment of the joint surface, supramalleolar osteotomy is indicated. An osteotomy may be indicated in rare cases with superficial varus deviation and poor joint alignment, accompanied by medial pain.

**OBJECTIVE**

The aim the present work is to present our surgical technique for supramalleolar metaphyseal osteotomy in haemophilic arthropathy with valgus deformity.

**MATERIALS AND METHODS**

The total patient population at the Foundation of Haemophilia in Buenos Aires Argentina is 2564. Seven patients with Haemophilia A were treated with metaphyseal supramalleolar osteotomy. All were men. The mean age was 14 years (5 to 32 years). The mean follow up was 8 years (2 to 18 years). No patients had Factor VIII inhibitors.

Osteotomies were performed in patients with joint line valgus deformity and pain. The mean angle of deformity of the joint, was 16° degrees (11° - 20°). All patients had haemophilic arthropathy of the ankle. According to Arnold Hilgartner’s score: two patients were grade II, four patients were grade III and one patient was grade IV Figure 2 [7]. We consider the radiographic classification of Arnold Hilgartner, is a simple x-ray classification system for hemophilic arthropathy and has been shown to correlate its degree with the degree of deterioration of arthropathy.

All patients were evaluated to observe subtalar joint involvement and only the patient with grade IV arthropathy 32 years old had subtalar arthropathy, but the patient did not report pain in the subtalar joint. None of the patients had equinus or shortening of the achilles tendon. The symptoms were lateral pain which increased with load on one foot. The mean Visual Analogue Scale (VAS) was 7 [5-9]. In the physical exam; all patients had ankle valgus deformity Table (1). Preoperative planning was performed and the medial wedge was calculated according to the degrees of deviation to be corrected (Figure 3). Our goal in the preoperative planning was to correct the joint line to 0° relative to the floor.

**Surgical technique**

No haemostatic cuffs were used. The approach was a 3 cm straight medial approach ending 1,5 cm distal to cartilage growth plate. The osteotomy was marked with radioscopy. No deseriperiostisation was performed, only a small approach to introduce the osteotome. The osteotome was parallel to joint surface 1.5 cm proximal to cartilage growth if it was open, and 2.5 cm when it was already closed. The osteotomies were performed up to the lateral cortex of the bone, and corticotomies were made. After that a superior wedge is resected (as calculated in preoperative planning). This wedge must end 1 mm before lateral cortex. Finally the osteotomies were closed and the ankle was moved to varus position. In five patients, three staples were used to fix the osteotomy: anteromedial, medial and posteromedial. In the other two patients, the osteotomy was fixed with locking plates. These patients had closed cartilage growth plate.

Two children (5 and 7 years old) had serious regional osteoporosis after metaphyseal hypervascularization which appeared during synovitis. The other five patients had normal bone. In all patients, the skin was closed with separates nylon stitches. No drainage was used. Patient’s ankles were immobilized with a Robert Jones bandage for 48 hours, after which they were immobilized with walker boots. Weight bearing was allowed at 6 weeks.

**RESULTS**

In all patients, the joint line improved the mean was 1° (-2° to 3°), VAS also decreased, with a range of 1 to 4 and a mean of 2. There were not possible to do a statitical analysis because the sample is to small (Table 2). The ROM did not improve, but pain decreased and the quality of life of the patients improved. All patients showed signs of consolidation at 6 weeks. There were no differences between patients with regional osteoporosis due to the method of osteosynthesis used (3 staples or locking plates) even though they had unfavourable conditions in the region (Figure 4). No patients had wound complications. It was not necessary to remove the osteosynthesis. The follow up time was 8 years (2-18 years). Three patients (43 %) had increased joint damage, regardless of the treatment performed, and progressed his degree of arthropathy.

**DISCUSSION**

Ankle arthropathy is frequent in PWH. The knowledge of the origin of pain in hemophilic arthropathy enables hemophilic surgeons to choose the right treatment. Pain killers and rehabilitation programs are useful for non mechanical pain. When the pain is mechanical, as in anterior impingement, medial impigment or overgrowth of the distal tibial malleolus, or in malalignment of the joint surface, surgery is the only solution. When mechanical factors are resolved, the pain decreases. Synovitis must be rapidly treated, because repetitive bleeding produces cartilage damage [8]. Synovitis only produces pain when intra-articular bleeding is significant and the joint capsule is in tension.

All patients in our population had valgus deformity with arthropathy. Gamble and Ribbons in their respective works stress that the persistence of synovitis leads to metaphyseal...
Table 1: Demographic Data.

<table>
<thead>
<tr>
<th>Patient Nº</th>
<th>Age</th>
<th>Side</th>
<th>Grade Of Arthropathy</th>
<th>VAS</th>
<th>Angle deformity</th>
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<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>Right</td>
<td>III</td>
<td>6</td>
<td>17°</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Right</td>
<td>II</td>
<td>No evaluated for the age</td>
<td>11°</td>
</tr>
<tr>
<td>3</td>
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<td>Left</td>
<td>III</td>
<td>7</td>
<td>14°</td>
</tr>
<tr>
<td>4</td>
<td>32</td>
<td>Right</td>
<td>IV</td>
<td>9</td>
<td>18°</td>
</tr>
<tr>
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<td>II</td>
<td>7</td>
<td>16°</td>
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<td>III</td>
<td>5</td>
<td>20°</td>
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<tr>
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<td>15</td>
<td>Right</td>
<td>III</td>
<td>8</td>
<td>16°</td>
</tr>
</tbody>
</table>

Table 2: Pre and Post Angle, VAS and ROM of all patients.

<table>
<thead>
<tr>
<th>Patient Nº</th>
<th>Angle Pre</th>
<th>Angle Post</th>
<th>Pain VAS Pre</th>
<th>Pain VAS Post</th>
<th>ROM Pre</th>
<th>ROM Post</th>
</tr>
</thead>
<tbody>
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<td>45°</td>
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<td>2</td>
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<td>-1°</td>
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<td>Not evaluated</td>
<td>55°</td>
<td>55°</td>
</tr>
<tr>
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<td>14°</td>
<td>-2°</td>
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<td>35°</td>
<td>30°</td>
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<td>3°</td>
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<td>1</td>
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<td>8</td>
<td>1</td>
<td>35°</td>
<td>35°</td>
</tr>
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</table>

Figure 1 X-ray of a patient with varus deformity and ankle arthropathy.

Figure 2 Arnold Hilgartner’s Score [7].

Figure 3 (1): Preoperative Osteotomy Planning: A- Tibial Mechanical Axis, B- Line relative to joint surface, C- Line relative to the floor, E- Osteotomy Wedge (2) Postoperative Osteotomy: A- Tibial Mechanical Axis, D- Line relative to the floor.

Regional osteopenia and hypervascularization which can result in the enlargement of the medial region, and the tibial malleolus, and cause progressive valgus deformity [2,5]. Joint malalignment and arthropathy are part of the same pathology, occurring after chronic synovitis.

Medial supramalleolar tibial osteotomies with lateral corticotomies increase stability. The contact area of the osteotomy is also increased due to metaphyseal overgrowth and increased spongy tissue. The percentage of consolidation was 100% Pearce and colleagues also report 100% consolidation [9]. Our technique is different because is performed incomplete lateral corticotomy and then with the closure of the osteotomy, the corticotomy is completed. In patients without hemophilia the results of consolidation are different with same cases of non union or delayed union [10-12]. The five children whose...
Osteotomies were fixed with 3 staples evolved satisfactorily, so we conclude that staples are in children with open cartilage growth. Preoperative planning and the wedge resection were effective, and the correction of the joint surface was a mean of 1° (-2°-3°). Pain decrease was an advantage of this procedure as the mean VAS was 7 (5-9) before treatment and 2 (1-4) after. No patients were pain free after treatment due to arthropathy. This shows that some pain is mechanic and when malalignment is resolved, the pain decreases significantly.

In four patients (57%) no progression of the arthropathy was observed. This way is due to joint surface correction, or to the patients young age and lower grade of arthropathy. In older patients with a higher grade of arthropathy, joint damage progressed. Osteotomy must be performed early on kids with hemophilia, chronic synovitis, pain and malalignment in order to avoid joint damage. In this series, none of the patients required an ankle arthrodesis or a joint replacement of the ankle because, when aligning the joint, the pain was reduced and the patients were clinically satisfied with the result.

The efficiency of the osteotomy has been in the reduction of pain, after correction of the articular axis. At 6 months postoperatively, the patients already objectively improved the pain, expressed by the VAS. As the osteotomy is an incomplete corticotomy of the tibia, it does not damage the tibial syndesmosis, and we have not therefore seen any secondary instability to it. Joint movement was related to the patient’s grade of arthropathy. All patients showed improved joint movement in the first two years after osteotomy, probably due to decreased pain. However only patients whose arthropathy did not progress continued to have improved joint movement.

**CONCLUSION**

Good clinical and radiologic evaluation and expertise in recognition of pain in ankle arthropathy in PWH allow surgeons to choose the treatment method.

**REFERENCES**


**Figure 4** X-ray (anteroposterior and lateral) pre (a) and postoperative (b) of patient who underwent to varus osteotomy.