

Achilles tendon ruptures treated by percutaneous tenorrhaphy - Multicentric study of 60 cases

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Summary: Percutaneous tenorrhaphy using the Delponte technique considerably improves the early and late results of Achilles tendon ruptures. By avoiding all plaster immobilisation it permits progressive weight bearing from the 14th day, without an increased risk of complications.

Key words: Achilles tendon — Rupture — Surgical treatment

In 1988 the members of the Orthopaedic Society of La Rochelle presented a series of 282 ruptures of the Achilles tendon [2], for the most part treated surgically. The study noted that recurrent ruptures were slightly more frequent after non-surgical treatment, while cutaneous complications (sepsis, necrosis, scar problems) were far more marked and specifically related to surgical treatment; that patients over 50 should not as a rule be operated on but treated appropriately by conservative means; and that only sportsmen justified routine surgical approach.

The first reported results of percutaneous treatment with a thread fitted with a barb attracted our attention [5]. This paper presents our first 60 cases to evaluate the technique.

The series

The first operation was done by one of us in 1993. The most recent case has been done for 6 months. Eight teams participated in this study. There were 10 women and 50 men, which was comparable to our series in 1988. The average age was 45 years, with a range from 18 to 85 years. The distribution of ages showed the majority of cases at 45 years. The rupture occurred during sports in 34 cases and at work in a further 4. A slip or fall in normal daily activities was the cause in 22 cases. These data are very similar in other reported series [3, 6, 9, 15]. To assess the activity level of our patients were used the "CLAS" system. Active sportsmen were the commonest. Seven were active competitors (C), 33 were leisure or recreational sportsmen (L), 13 simply considered as active (A) and 7 sedentary (S). The latter were the oldest. Overall the majority of patients treated were men in the prime of life, active both professionally and in sports. It is therefore of considerable interest to know the timescale and potential for rehabilitation in this population.

The clinical diagnosis of Achilles tendon rupture is usually easy and adequate on its own. The patient will have felt a severe pain during a sudden movement or force, accompanied by a frequently audible crack felt like being struck by someone else (blow from a racket or stick), followed by a functional deficit which is difficult to explain. Comparison of the two sides in the prone position allows diagnosis. There is loss of the

skin contour with a painful depression on palpation. There is loss of equinus over the end of the table (the Brunet Guedj sign) [6], unilateral loss of muscle reflex, positive Thompson sign on compressing the calf muscles [14], negative O'Brien needle test [13]. Plain x-ray is useful for exclusion of any associated pathology, has a regular appearance of a calcaneus position of the foot. The Kager triangle [7] is a reliable sign according to Cetti [4]. Sonography frequently suggests a partial rupture while the clinical signs indicate a complete rupture, and this is borne out by operative observations. Sonography does not seem to be useful to us in the diagnosis of Achilles tendon rupture.

Percutaneous tenorrhaphy

This was done in our series with a specific device, related to the Barb wire, which is well known for the treatment of extensor tendon lesions in the fingers. Marketed as the "Tenolig" the device consists of a 2-mm Dacron thread, swaged on a 12-cm needle, on which is threaded a Y-shaped hook. As for the Barb Wire, the skin fixation is by washers and lead shot. This Barb is used to lower the proximal end of the Achilles tendon, which is retracted under the action of the triceps surae.

Insertion technique

The operation is done with the patient prone and under general or spinal anaesthetic. A tourniquet is unneces-

sary. The landmarks palpated are drawn with a skin markers as follows: the ends of the tendon and 4-5 cm above the needle insertion points. A 1-cm skin incision is made for each of the insertion points. The needle is curved as needed for its planned trajectory and then held in a strong needle holder is threaded into the ruptured proximal end, across the rupture and then out through the distal fragment, exiting at the upper border of the calcaneum. This is continued with 2 or 3 needles. The best exit point is on either side of the distal part of the Achilles tendon immediately above the calcaneum. The foot is held in maximum equinus so that the hook can be pulled into contact with the proximal end of the tendon. Stretching with a small haemostat helps the Barb to go through the skin and the sub-cutaneous layers. The traction on the thread is then maintained by crimping the lead shot onto the threads over the washers. At both ends the thread should be cut leaving a tail. The proximal end will be used to remove the device. A light dressing is applied over the wound, no splintage is necessary. At the end of the operation physiological equinus has been restored, sometimes increased over the other side. The post-operative plan, advised by originator of the method, is as follows: the patient mobilises himself without weight bearing during the first 2 weeks, with ankle movements being limited by the pain threshold. Thereafter progressive weight bearing with 2 elbow crutches is allowed, under the supervision of a Physiotherapist, with a start to passive-active re-education. The Physiotherapist seems essential to ensure that the patient heeds the advice, which for some may seem harsh may for others easy to exceed. Full weight bearing is usually achieved by the 5th week. The device is removed between the 4th and 5th weeks. Our series is similar to the above principles. There were roughly equivalent numbers of general and spinal anaesthetics. Two "Tenoligs" were used in 53 cases and 3 in 7. In 3 times the rupture was treated with this

method, but open. (1 deliberate open case at the start of our experience and 2 late ruptures) We will discuss the consequences on the results. The average hospital stay was 3 days. The implant was left in place for an average of 35 days. In the majority it was easily removed without any anaesthesia. The physiotherapy prescribed in 49 cases lasted an average of one month, which is much shorter than after classical forms of treatment. The average follow-up was 10 months, with a range from 6-30 months. The few cases who only had a follow-up of 6 months had recovered mobility and normal function well before that time.

Complications

- *Skin.* These were rare and minimal in 5 cases, without any effect on the functional result. Two severe wound problems required removal of the implant with prolonged plaster immobilisation. In one case a painful scar persisted. These 2 cases with sepsis followed our open cases, once in the planned open case and the other treated at 50 days after injury. These two complications supported our principle of reducing as far as possible the indications for open surgery.

- *The implant.* The "Tenolig" sometimes seemed fragile since in 5 cases the thread ruptured at the level of the Barb. An untimely step often involuntary usually caused these incidents. In 3 cases these ruptures were treated with a short term plaster, one case with strapping and one case with simple reduction in weight bearing since the rupture happened at some time from the operation. These 5 cases did not have poorer results than the rest of the series. The recent improvement in the implant seems to have abolished this type of complication.

- *Regional.* There were 3 deep vein thromboses, 1 case of algodystrophy and 2 late ruptures. The 3 deep vein thromboses occurred in 2 patients of whom one aged 55 had bilateral rup-

tures. These complications occurred in spite of thromboprophylaxis and did not have serious consequences, but clearly delayed the final recovery. They confirmed our liberal use of thromboprophylaxis, even in early cases, and in surgery without a tourniquet.

One case of algodystrophy occurred in a young woman. It required specific treatment and delayed the final recovery. This technique does not totally prevent the complications observed with other treatments, and one has to look out for them. Two re-ruptures (3.3%) occurred in the 8th and 11th weeks and thus fairly early without real trauma. This incidence is similar to that published by Delponte and longer than with other techniques, particularly with classical conservative treatment. One case was repaired by further tenorrhaphy, the other by classical open operation. The long term result was respectively very good and good. One can therefore say that per-cutaneous tenorrhaphy in Achilles tendon ruptures does not totally prevent re-rupture, but it decreases the incidence and allows easy revision.

Results

Using the criteria from other series, we assessed the recovery of tibiotarsal movement, the force of the biceps surae, pain the local appearances, saphenous nerve damage, the level of return to work and sport and finally the subjective opinion of the patient. Our score comprised 24 points.

Plantar flexion appeared normal in 58 cases and dorsiflexion in 55 cases. The biceps strength was normal in 54 cases. The return to work seemed to be relatively quick after an average of 75 days with a range from 30 to 180 days. This is one of the most positive aspects of this method with respect to other techniques. The recovery of sporting activities is of particular interest in Achilles tendon ruptures, since there were 41 sportsmen in the 60 cases. Out of the 7 competitive sportsman, 6 returned to the same level after an average of 130 days. As for the leisure or recreational sportsman (34 cases), 23 returned to

the same level, 7 to a lower level and 4 stopped for other reasons. The average time to return to leisure sports was 120 days. Per-cutaneous tenorrhaphy therefore seems to allow early return to sporting activities, while in our 1988 study only a third returned to sports after a much longer delay.

The subjective results corresponded to the objective signs. Only one patient was dissatisfied and 2 thought the result fair. The objective results, using the above criteria, showed 2 bad results (the two serious skin complications), 3 fair results, 22 good and 33 very good. Overall 92% of patients had good or very good results, with a score of 22.4 out of a maximum of 24.

Discussion

Per-cutaneous tenorrhaphy seems to have considerable value. Our experience stands comparison with other purely or mainly surgical series (Castaing 1972, Rouvalchouc 1976, SOR 1989) and with two non-surgical series (Lea and Smith 1968, Kouvalchouc and Rodineau 1984) and to a similar approach with indirect surgery (Aldam 1989 and Ma and Griffith 1977).

In 1968 Lea and Smith [10] in a short series used a conscientious non-surgical treatment and abandoning conservative treatment over many weeks these authors suggested a below knee cast in equinus for 4 weeks, followed by a period of immobilisation with the foot close to a right-angle, followed by the use of a heel raise for several months. Delay in diagnosis did not seem to them to be a contra-indication to this treatment. Their results were confirmed in 1972 [11] in a larger series of 55 cases.

In 1972 Delplace reported with Jean Castaing [3] the numerous problems with surgical treatment, neuromas 7%, scar problems 10%, disabling weakness of the biceps surae 12%. The conclusion favoured conservative treatment. Kouvalchouc's studies are worth reviewing [8, 9]. Overall surgery had the highest rate of complications (26%) with infections, skin necrosis and late skin and nerve problems. Conservative treat-

ment had a high incidence of rerupture (13%), usually occurring in the first 2 months after removal of the plaster or after premature return to sport or an untimely step. Kouvalchouc noted a decrease in planter flexion, which is a sign of joint stiffness, in 50% of the operative cases and only 12% of the conservative cases. Dorsiflexion (a possible sign of Achilles tendon elongation) was increased in 50% of the conservative treatments (average 10°), although after surgical treatment it was only increased in 15% of cases, although it was diminished in 10% of the operative cases indicating joint stiffness and Achilles tendon shortening. As for return to sport, patients with an average age of 43 years only 2 of the 21 sportsmen who had operations were able to return to the same level, while 16 of the 25 patients treated by plaster returned to sports but late - 8 months after removal of the last plaster. In 1989 with members of the La Rochelle Orthopaedic Society [2], after analysing the results of 30 conservative cases and 252 operative cases, we concluded «We would urge a reduction, although not exclusion, of surgery and reserving it for re-ruptures and for fresh ruptures only in the young sportsman». We have used this approach in the last 4 years without major complications, but the penalty of conservative treatment is the long period of disability which made us think of other methods of treatment.

Is per-cutaneous tenorrhaphy a solution?

Aldam [1] who used a frame to lower the proximal segment towards the tendon with an approach remote from the rupture, protected his tenorrhaphy by 6-8 weeks in an equinus cast following by 4 further weeks with a heel raise. Out of the 41 cases treated this one he reported only one re-rupture in the 5th month, only one infection - which resolved and good recovery of biceps strength in 39 cases.

Delponte has results similar to ours, particularly as regards re-rupture which occurred in 5 early cases and one late at 2.5 months following an accidental fall. All these ruptures were treated by the

same per-cutaneous method with the precaution of delayed weight bearing and later return to activity without late problems.

The results of our series seem to be a new plea for per-cutaneous tenorrhaphy in the treatment of Achilles tendon rupture. This technique allowed early re-education with progressive weight bearing from the second week, allowing a limitation of joint stiffness and encouraging tendon healing. In particular, in contrast to classical open or conservative treatments, it allowed a prompt return to work (75 days) and sports (120 days). Percutaneous tenorrhaphy in Achilles tendon ruptures seems therefore for little cost to reduce the seriousness of the consequences of this injury. It has even been used in rupture presenting late, beyond the 30th day, which is rare and generally observed in the elderly.

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Ruptures du tendon d'Achille traitées par tenorrhaphie percutanée. Étude multicentrique de 60 cas

Résumé : La ténorrhaphie percutanée, appliquée selon la technique de Delponte P, améliore notablement les résultats précoces et secondaires des ruptures du tendon d'Achille (60 cas). En l'absence de toute immobilisation plâtrée, elle autorise un appui progressif à partir du quinzième jour, sans exposer à un taux anormal de complications.

Mots-clés : Tendon d'Achille — Rupture — Traitement chirurgical

Book reviews

Eur J Orthop Surg Traumatol (1997) 7: 40

Normale Entwicklung des Säuglings und ihre Abweichungen

I. Flehmig (1996) Georg Thieme Verlag, Stuttgart New-York. 311 p., DM 39,80 (ISBN 3-13-560605-8)

This paperback manual makes as enthralling reading as a novel. One does indeed see in it the child grow from the new-born stage to the age of 18 months in its normal development. After solid neurophysiologic and developmental reminders, in particular the chapter on the hip which is very clearly presented, one follows the new-born during its growth. At every stage, i.e. each month, the pathological events to look for are precised. All of it is abundantly illustrated by sketches and photographs. The manual ends up with a chapter named "handling" (the German language has its anglomania too) which describes the way doctors, nurses and mothers must hold the baby according to its age.

This remarkable work, whose actual edition is the fifth one, unchanged, should deserve to be translated into French or at least into English.

P. Kehr

Gonarthrosen. Gelenkerhaltende Operationen versus Gelenkersatz

Th. Stuhler (eds) (1996) Georg Thieme Verlag, Stuttgart New-York. DM 148 (ISBN 3-13-102621-9)

This book gathers under the direction of Thomas Stuhler a debate by expert surgeons about the knee arthrosis surgery. In two words, should one continue to perform osteotomies of which we have a long experience and good results - despite the difficulty of a gesture that has to be very precise, and despite long operative - or should we propose a replacement (uni or tricompartmental prosthesis) of a more recent experience - with a more rapid result - and which one?

This book tries to answer this double question from experiences of various teams, taking into account the long term results, the complications, the indications or the operative technique.

The history, the biomechanics, the pathogenesis and the diagnosis serve as an introduction. Particular problems, such as those of the instrumentation of the patella or of hinge prostheses is also considered. This book corresponds in fact to an instant photography of the actual stage of knowledge. Its advantage - and disadvantage - is, thanks to the intervention of numerous authors, an exhaustive view, but papers of unequal nature and without the reader being able to draw a clear conclusion out of it.

This book will be of an interest to all surgeon interested in the knee, and the younger in order to get a global overview of actual results.

A.G. Graftiaux

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