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TREATMENT OF DELAYED UNION AND NON-UNION OF THE TIBIA BY FIBULAR RESECTION

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The treatment of pseudo-arthrosis of the tibia or delayed union following fracture is still a difficult orthopaedic problem.

As a rule the treatment consists in grafting, either in the form of a tibial or iliac bone graft, combined with freshening of the fracture ends and possibly metal fixation. In some cases an iliac bone graft is inserted into the defect following resection of the pseudo-arthrosis, or fixation with plate and screws is used, while in other cases the procedure is restricted to the insertion of a graft or chips at the fracture site. Some surgeons do tibio-fibular synostosis. As a rule, these are major procedures which require great experience and technical skill. In spite of repeated operations, it is in some cases impossible to obtain union, and in a few instances the procedures are complicated by infection which may prevent union.

The considerations concerning the causes of non-union sometimes include the assumption that the tibial ends are kept apart by the fibula. Among 175 tibial fractures with intact fibula *Nicoll* (1964) found delayed union or non-union in 9 per cent as compared with 29 per cent out of 499 cases in which the fibula was fractured too. Therefore, the fibula was considered to play a role only by influencing the initial displacement of the fracture ends.

In the comprehensive literature on the treatment of delayed union or non-union of tibial fractures, fibular osteotomy is but seldom mentioned and only in connection with other forms of surgery on the tibia.

Among 100 cases of delayed union or non-union of tibial fractures *Sakellarides et al.* (1964) carried out fibular osteotomy in 22 cases

simultaneously with grafting the tibia. Union took 10.7 months on an average, compared with 10.9 months for 34 fractures treated in the same way, but without fibular osteotomy. The osteotomy facilitated the correction of faulty positions and the placement of the fracture ends, especially in the presence of bony defects.

Koskinen (1963) used fibular osteotomy combined with compression of the fractured ends of the tibia by means of Steinmann's pins in 2 out of 4 cases of delayed or non-union. Both united, in 7 and 8 months.

In combination with Hoffmann osteotaxis, *Felländer* (1963) performed fibular osteotomy on 2 out of 14 tibial pseudarthroses. One failed to unite.

Simple osteotomy on the fibula can hardly be attributed with major importance, since as a rule the fibula will undergo solid union within 3 months, as it is amply vascularized, while the tibia requires 7–10 months to unite. Therefore, a piece of the fibula has to be resected, so that it does not unite before the tibia.

Lottes (1966) always resects at least 2.5 cm of the fibula in combination with medullary nailing of the tibia in cases of delayed or non-union. No other authors have recommended the routine use of fibular resection.

METHOD

Since 1955 the treatment of delayed union or non-union of the tibia at the Orthopaedic Hospital, Aarhus, has consisted in resection of a piece of the fibula on a level with the tibial fracture which was not touched. After the operation, a plaster cast is applied from the toes to high up on the thigh until union occurs. If the tibia has been sclerotic and therefore stiffer and more brittle, the plaster cast is followed by a foot-leg capsule of leather for a few months as a prophylaxis against re-fracture.

MATERIAL

From 1955 to 1.4. 1965 29 patients (pts.) with 30 fractured legs were treated, 8 were females (9 legs) and 21 males. All were fairly young, 6 females and 12 males being under 30 (Table 1). 18 pts. (19 legs) had been injured in traffic accidents, including 12 on motor cycles. Out of 20 complicated fractures 16 had been sustained in traffic accidents. The fibula was fractured in 26 cases. 27 fractures were localized 5–18 cm above the ankle joint, 10 were comminuted, 8 were transverse fractures, 12 oblique fractures or spiral fractures. Two patients had bilateral tibial fracture and 3 homolateral fracture of the femur.

20 legs, including 11 with complicated fractures, had been treated in the local hospitals by primary osteosynthesis (6: Rush pins, 7: Parham's bands, plate and screws: 7). The metal had been removed in all cases at the end of an average period of 7 (3–17) months. Two legs underwent re-operation 3 and 13 days after

the primary operation because of instability at the fracture site. Both fractures were complicated.

At an early stage 7 developed osteitis, combined with necrosis of the skin in 6. Five of these fractures were complicated. Primary osteosynthesis had been performed on 5. Another leg exhibited paresis of ischaemic origin and contracture of the foot in the equinus position.

Table 1. Age distribution and sex ratio of 29 patients (30 legs) with non-union or delayed union of the tibia, stating the type of accident (mc = motor cycle).

Age	Males	Females	Traffic	(mc)	Workplace	Sport	Total
14–19 years	3	4	4	(2)	2	1	7
20–29 „	9	2(3)	9(10)	(7)	1	1	11(12)
30–39 „	4		3	(2)	1		4
40–49 „	5		2	(1)	2	1	5
60–66 „		2			2		2
Total	21	8(9)	18(19)	(12)	8	3	29(30)
Complicated	15	4(5)	15(16)	(10)	3	1	19(20)
Right	14	3					
Left	7	6					

Table 2. Duration of plaster treatment primarily and following fibular resection (FR) and duration of completed leather foot-leg capsule bandaging. The figures refer to the number of legs.

Duration (months)	Plaster cast		Leather capsule
	Primary	After FR	
1–4	6	5	
5–8	8	20*	8
10–15	9	2	3
18–22	6	2	2
28–34	1	1	1
Still wearing bandage		2	8
Average duration of bandaging	11	7.5	11

* Average 6 months.

Owing to non-union secondary operation had been carried out on 8 legs: Drilling of the fracture ends by the method of Beck: 3 legs, grafting: 4 legs, fibular resection and later re-osteosynthesis using Rush pins: 1 leg. These operations had been performed an average of 8 (4–11) months after the accident.

When the patients were referred to the Orthopaedic Hospital, Aarhus, they had been in plaster for an average of 11 months (Table 2). In two cases a toe-to-knee cast had been used. 18 legs exhibited non-union and 12 delayed union.

At the Orthopaedic Hospital they were treated by fibular resection, performed in cases of non-union an average of 26 months after the accident and in cases of delayed union at the end of 10 months (Table 3). Apart from a defect in the operative wound in 1 patient, which healed in 3 months, there were no complications. The defect in the fibula was measured radiographically after the operation and application of plaster cast; it ranged from 0.2–6.5 cm in length (Table 4).

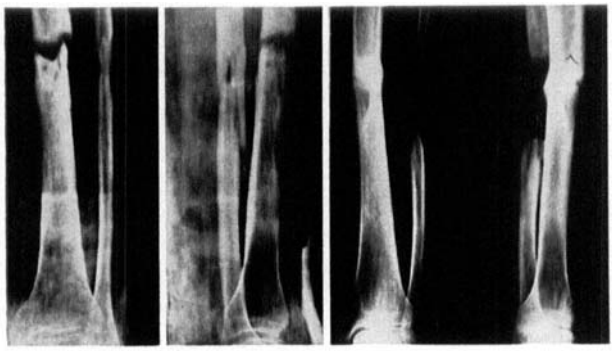
Table 3. Time of fibular resection (FR) after accident.

No. of legs	FR months after accident. Range	Average
10	6–11	8
14	13–23	18
4	24–33	29
2	63–79	71
Delayed union 12	6–18	10
Non-union 18	10–79	26

Table 4. Fibular defect measured radiographically after the operation and application of plaster cast. At the bottom: Fibular defect at the time of analysis, when 26 tibial fractures had united. The fibula had united in 7 cases.

Defect cm	0.2–0.7	1–2	2–3	3–4	4–5	5–6	6–7
30 legs	5	5	6	7	3	3	1
19 legs at the time of analysis	4	7	3	2	2	1	

After the fibular resection a plaster cast was applied, from the toes to high up on the thigh, and this cast was left on for an average of 7.5 months (Table 2). When disregarding 3 cases in which the cast was kept for a very long time, there was no relationship between the duration of this bandaging and the time which had passed from the fracture until the fibular resection. 17 patients were discharged at the end of about two weeks with a Thomas splint over the cast. The stay in hospital was very short. Weight-bearing was allowed after an average of 7 months (25 pts. after an average of 5 months and 5 after 16 months). After the plaster cast had been removed, 21 patients (22 legs) were supplied with a leather foot-leg capsule which 14 of them wore for an average of 11 months (Table 2), while 7 were still wearing it at the time of writing.



a *b*

Figure 1. A 29-year-old man with a complicated fracture of the lower leg. Primary osteosynthesis with plate and screws, removed at the end of 5 months because of cutaneous necrosis and osteitis. After chiselling off the bony necrosis, a plaster cast was applied and worn until 17 months after the accident. Thereafter, fibular resection and removal of sequester. The skin had healed 2 months later. The fibula rapidly united (radiologically the defect was only 0.5 cm). Re-resection of the fibula was done 10 months after the first resection. 9 mo. later the fracture was firm (36 mo. after the accident). Thereafter, a leather capsule has been worn, so far for 11 mo. No osteitis. The films show: (a) 13 mo. after the accident. A large defect in the tibia, osteitis. The fibula has united (resection 4 mo. later). (b) 46 mo. after the accident (20 mo. after the second fibular resection). Union, but the fracture line may be discerned. Sclerosis, but no increase in width. A 5½ cm fibular defect.

RESULTS

Union was obtained in the case of 26 fractures, while 4 have not yet united.

Among the 25 pts. who obtained union 2 had *re-fracture* following an adequate trauma. The fractures united, one after treatment in plaster cast and the other after a tibial grafting done abroad.

In 4 cases there were *problems concerning the union.* In 2 the fibula healed too fast, as too little had been resected. After re-resection of the fibula and plaster cast, union was obtained (Figure 1). In 2 pts. union was again followed by looseness, 11 and 16 months after the fibular resection. Union was then obtained after renewed bandaging, in one of the cases merely by continuing the use of a leather foot-leg capsule, which resulted in firm union 5 months later.

At the time of analysis, an average of 41 months after the fibular resection, 26 pts. exhibited bony union. 9 had not had leather bandage after the plaster cast; 12 patients had stopped using the leather bandage, while 5 were still wearing it.

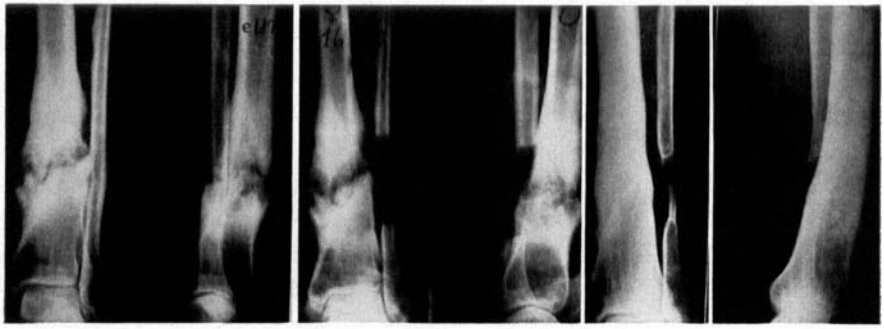


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Figure 2. A girl, aged 16 years. The tibial fracture had been treated primarily by Parham's band and plaster cast for 4 mo. Thereafter the Parham band was removed. Weight-bearing 5 months after the accident. (a) 12 mo. after the accident, just before the fibular resection. (b) Immediately after fibular resection. 6 mo. later there was firm union of the fracture, and weight-bearing was possible without a bandage. (c) 48 mo. after fibular resection. Solid union of the tibial fracture with a near-normal bony structure. The fibular defect is still visible.

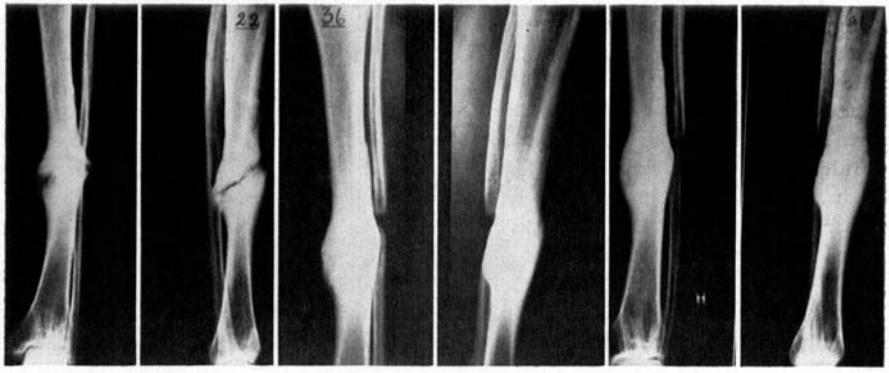

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Figure 3. A man, aged 33 years. Complicated tibial fracture treated with plaster cast and 4 mo. later drilling by the method of Beck and Parham's band which was removed 4 mo. later. Plaster cast for a total of 13 mo. (a) 22 mo. after the accident. Non-union with sclerosis, increased width, and closed medullary cavities. Note the arched (not fractured) fibula keeping the fragments apart! (b) 36 mo. after the accident (12 mo. after fibular resection). The pt. wore a plaster cast for 4 mo. after the fibular resection, and then weight-bearing was allowed in a leather foot-lower leg capsule which was worn for 9 months. The film now shows smoothing of the surface, but still sclerosis. The increase in width has decreased from 47 to 40 mm. (c) 82 mo. after the accident (60 mo. after the fibular resection). Further normalization. Still a ¾ cm defect in the fibula. (The pt. has no subjective complaints. All joints are free, and there is no shortening. The circumference of the thigh is reduced by 1 cm and that of the lower leg by ½ cm).

Radiologically the union was solid in all 26 cases. There was slight angulation (less than 10°) at the fracture site in 7. The skeletal structure at the fracture site was normal in 11, while 5 exhibited slight and 10 more pronounced sclerosis in an area of 2–8 cm. The thickness of the tibia at the fracture site was normal in 14, while in 12 it was thickened in both views, by an average of 12 mm. The fibula had united in 7, while in 19 there remained a defect of 0.2–5.5 cm at the site of resection (Table 4). There was no displacement between the two bone ends, no subjective complaints that could be ascribed to the defect, and no tenderness at its site (Figures 2–3).

In 4 cases union was not obtained. Two of these patients are still wearing the plaster cast, and union is expected. Both developed looseness after union had been obtained (cf. case reports 1–4).

CASE REPORTS

Case 1. A 47-year-old man with bilateral, complicated fracture of the lower leg. The fracture on the right healed with a plaster cast. The left leg was primarily fixed by plating, an iliac bone graft, and plaster. At the end of 10 months (mo.) a tibial sliding graft was inserted, but 8 months later there was non-union in spite of a plaster cast. After fibular resection and plaster cast the fracture remained non-united, so that 6 months later an iliac graft was inserted and chips were applied around the fracture site after removal of the plate. After a plaster cast had been worn for 12 months the fracture was firm. Although the patient wore a leather capsule, looseness occurred 4 months later when he fell off his bicycle. After another 4 months with a plaster cast, the patient refused further treatment except for the leather capsule. 71 months after the fracture had been sustained, amputation of the lower leg had to be performed.

Case 2. A 45-year-old bricklayer with a comminuted, complicated fracture of the lower leg, primarily treated with cerclage and plaster cast. Necrosis of the skin and a defect with osteitis persisted for months. The cerclage was removed at the end of 3 months, and 11 months after the accident fibular resection 11 cm above the fracture site was performed in the local hospital. 24 months after the accident 2 Rush pins and an iliac graft were inserted, but skin necrosis recurred. The patient wore a plaster cast for a total of 33 months. Looseness was observed 62 months after the accident, and the 2 Rush pins were removed. One month later fibular resection was performed with application of plaster cast + Thomas splint. There was slight instability at the end of 6 months. Thereafter, a leather capsule was worn for 5 months and a plaster cast for 8 months. 79 months after the accident the fracture was firm and remained so for 15 months during which the patient wore a leather capsule. Then, he again exhibited looseness and signs of arterial insufficiency (no palpable pulse in the popliteal region or on the foot). Amputation of the lower leg was suggested, but the patient managed his work in an architect's office without complaints and did not want to have the operation.

Case 3. A 22-year-old woman with bilateral, complicated fracture of the legs, both treated with Rush pins, Parham's bands, and plaster cast for 22 months. When the metal was removed there was considerable looseness. Fibular resection was done on both sides. Radiologically, the fibular defect on both sides was only 0.2 cm. The *left* tibia was firm at the end of 3 months and the fibula had united. The patient walked in a plaster cast for 2 months and was then provided with a leather capsule. Looseness was demonstrated 11 months after the fibular resection, but 5 months later the fracture was stable. 41 months after the fibular resection the site was still firm, and the patient had no symptoms, but she was still wearing the leather capsule as the right tibia was not firm.

On the *right* the fibula united in 3 months. At that time the tibia was firm. The patient walked in a plaster cast for 5 months. Thereafter, the tibia was loose, and re-resection of the fibula was performed, so that the defect was 2.1 cm on the X-ray film. 10 months later there was still looseness in spite of a plaster cast without weight-bearing. The patient was now pregnant and managed with a leather capsule for 10 months. Thereafter, a tibial sliding grafting was done. 7 months later, while she was confined to bed before a new cast had to be applied, and the site showed firmness, fracture of the graft and looseness occurred. After another 7 months in a plaster cast there was firmness, and X-rays showed union by a fairly slender bone through two-thirds of the fracture. The patient is still wearing the plaster cast.

Case 4. A 66-year-old woman. The fracture had been treated primarily by 3 Parham bands on the tibia, removed 7 months later. During the first 4 months after the accident the patient wore a plaster cast from the toes to the middle of the thigh, thereafter to the knee for 6 months, after which weight-bearing without a cast had been allowed. 9 months later there was looseness, so that a plaster cast was again applied, to the middle of the thigh, and worn for 3 months. Two months later fibular resection was performed, and after a plaster cast had been worn for 7 months firmness had been obtained. After 17 months in a leather capsule instability had returned. So far, the patient has been wearing a plaster cast to the middle of the thigh for 5 months. X-rays show signs of union, and there is no indication of pseudoarthrosis. The fibular defect measures 2 cm. Union is expected to occur.

DISCUSSION

Fibular resection followed by application of plaster cast does not appear to have been described in the literature as treatment of non-union or delayed union of the tibia.

The *advantages* of this method are as follows:

1) The operation is technically easy and can be performed by younger and less experienced surgeons than all other current procedures.
2) Faulty positions at the fracture site are easy to correct.
3) Effective compression at the fracture site is secured until union occurs, but only if a sufficient portion of the fibula is resected, *i.e.* 3–4 cm. When measured on the X-ray film through the plaster, the

defect is found to be shorter than measured at operation, due to sintering at the fracture site. The resection has to be done extraperiosteally to prevent union of the fibula before tibial union takes place. A lasting fibular defect gives no complaints.

4) Operation upon the fracture site itself is avoided, with the consequent risk of infection or damage to the vascular supply which is often poor owing to previous operations.
5) The method is applicable in spite of a skin defect over the fracture site or osteitis. It is devoid of complications.
6) The patients may be mobilized a few days after the operation and can soon be discharged.
7) The method is applicable at an early stage, when union is too slow and before pseudo-arthrosis has developed.
8) The assurance that this method is applicable later ought to obviate hazardous operations primarily, especially upon severely complicated fractures, and quite particularly if they are closed.

The method may be used, but is *less suited* in the presence of a full-blown pseudo-arthrosis with sclerosis of the fracture ends and closure of the medullary cavity. Even though union is obtained, the bone is stiff and brittle, and re-fracture may be caused by minor traumas. However, this applies also to other methods, so that the present method, being least risky, may be tried and other methods then used, should re-fracture occur.

Table 5. Rate of non-union following various pseudo-arthrosis operations, predominantly grafting, on the tibia.

Author	Delayed union	Non-union
Biström 1955		0 of 14 (0 amputated)
Felländer 1963	1 of 9	3 of 19 (1 amputated)
Nyberg 1955		9 of 36 (2 amputated)
Sevastikoglou 1965		3 of 11 (1 amputated)
Scandinavian authors		15 of 80 (4 amputated) 19%
Anderson 1966 (Australia)	19 of 189 = 10%	
Hanson & Eppright 1966 (U.S.A.)	3 of 26 = 12% (1 amputated)	
Sakellarides et al. 1964 (U.S.A.)	16 of 100 = 16% (11 amputated)	
Present series	4 of 30 = 13% (1 amputated)	

The *time required for union*, which in this heavy material averaged 7½ months, is no longer than following other, more complicated surgical methods. Following osteotaxis by the method of Hoffmann in combination with pseudo-arthrosis surgery, *Felländer* (1963) found an average healing time of 5 months. Following bone grafting *Sakellarides et al.* (1964) found a healing time of 9–11 months, while *Murray et al.* (1964) obtained union in 7 months following fixation with 2 plates.

The results, assessed by the rate of union and the frequency of amputations, correspond largely to those obtained by other, more complicated methods (Table 5).

SUMMARY

Eighteen cases of tibial pseudo-arthrosis and 12 cases of delayed union were treated exclusively by extraperiosteal resection of a piece of the fibula on a level with the fracture, followed by application of toe-to-groin plaster cast.

Primary osteosynthesis using metal fixation had been performed in 20 cases elsewhere; among these fractures 11 were complicated. Osteitis was present in 7 cases. In 8 cases a pseudo-arthrosis operation had been carried out previously. The patients had worn plaster casts for an average of 11 months when the fibular resection was done. Union was obtained after the plaster cast had been on for an average of 7½ months. Thereafter, 21 patients wore a leather foot-lower leg capsule for about 1 year to protect from re-fracture in the event of bony sclerosis around the fracture site.

Union was obtained in 26 cases, and all the cases of osteitis subsided. Two patients had re-fracture following new trauma, but union was obtained. In 2 cases the fibula healed too soon, as too little had been resected, but union was obtained following re-resection. A few months later 2 patients had looseness again, but union was obtained after bandaging.

Four fractures failed to unite. In all 4 cases firmness had been obtained. One sustained re-fracture following trauma and later had to undergo amputation, and one is managing in a leather capsule. Two patients are still wearing the plaster cast, and union is expected to occur.

The method is simple and easy. It may be carried out by less experienced surgeons and it permits correction of faulty positions. Effective compression at the fracture site is obtained until union occurs, if

3–4 cm of the fibula are resected extraperiosteally. There is no risk of infection or damage to the vascular supply to the fracture. The patients can soon be mobilized and discharged. The method is applicable without risk in the event of a suspicion of problematic union, prior to the development of osseous changes which lead to pseudo-arthrosis. With this method in reserve, hazardous primary operations may be avoided. This is of the utmost importance, as infection, delayed union, and development of pseudo-arthrosis have increased in frequency after primary operative treatment came into more common use.

RESUME

Dix-huit cas de pseudarthrose tibiale et 12 cas de soudure différée ont été traités exclusivement par résection extrapériostale d'un morceau du péroné au niveau de la fracture, suivie de l'application d'un plâtre allant des orteils à la cuisse.

Une ostéosynthése primaire utilisant une fixation métallique a été pratiquée ailleurs dans 20 cas; parmi ces fractures, 11 étaient compliquées. Une ostéite existait dans 7 cas. Dans 8 cas, une opération de pseudarthrose avait été pratiquée antérieurement. Les malades avaient porté une forme en plâtre pendant une moyenne de 11 mois lorsque la résection du péroné fut faite. La soudure fut obtenue après le port du plâtre pendant 7 mois et demi en moyenne. 21 malades portèrent ensuite pendant environ un an une gaîne en cuir enfermant le pied et le bas de la jambe pour empêcher une nouvelle fracture dans le cas d'une sclérose osseuse du côté de la fracture.

La soudure a été obtenue dans 26 cas et dans tous les cas d'ostéite celle-ci a diminué. Deux malades ont subi une nouvelle fracture à la suite d'un nouveau trauma, mais la soudure fut obtenue. Dans 2 cas, le péroné s'est guéri trop rapidement, une trop petite partie ayant été enlevée, mais la soudure fut obtenue après une nouvelle résection. Quelques mois plus tard, il se produisit un relâchement chez 2 malades, mais la soudure fut obtenue après l'application d'un bandage.

Dans quatre fractures, il n'y a pas eu de soudure, mais la fermeté a été obtenue dans tous les quatre cas. L'un fut atteint d'une nouvelle fracture à la suite d'un trauma et dut subir plus tard une amputation, un autre se débrouille avec une gaîne de cuir. Deux malades continuent à porter une forme en plâtre et l'on suppose que la soudure se fera.

La méthode est simple et facile. Elle peut être pratiquée par des chirurgiens qui n'ont pas une grande expérience et permet la correction

de positions fausses. Une compression efficace du côté de la fracture est obtenus jusqu'à ce que la soudure se fasse, en pratiquant une résection extrapériostale de 3–4 cm du péroné. Il n'y a aucun risque d'infection ou de dommages à l'approvisionnement vasculaire de la fracture. Les malades peuvent être rapidement mobilisés et guéris. Même si l'on soupçonne une soudure problématique, la méthode est applicable sans risques avant le développement de modifications osseuses, menant ù une pseudarthrose. Avec cette méthode en réserve, on peut éviter des opérations primaires hasardées. Ceci est de la plus haute importance étant donné que les infections, les soudures différées et le développement de la pseudarthrose apparaissent beaucoup plus fréquemment depuis que le traitement opératoire primaire est devenu plus courant.

ZUSAMMENFASSUNG

Achtzehn Fälle von Tibiapseudarthrose und 12 Fälle von verzögerter Heilung wurden ausschliesslich mittels extraperiostaler Resektion eines Stückes der Fibula in der Höhe des Bruches mit folgender Anlegung eines Gipsverbandes von den Zehen bis zur Leistengegend behandelt.

Ursprüngliche Osteosynthese mittels Metallfixierung war in 20 Fällen anderswo ausgeführt worden. 11 von diesen Brüchen waren kompliziert. Osteitis war in 7 Fällen vorhanden. In 8 Fällen war vorher eine Pseudarthroseoperation ausgeführt worden. Die Patienten hatten im Durchschnitt einen Gipsverband von 11 Monaten getragen wenn die Resektion der Fibula vorgenommen wurde. Heilung wurde erzielt nachdem der Gipsverband durchschnittlich für 7½ Monate belassen worden war. Hernach brauchten 21 Patienten eine Lederhülse für Unterschenkel-Fuss während ungefähr eines Jahres, um eine Refraktur im Falle einer Knochensklerosierung an der Bruchstelle zu verhindern.

Knöcherne Heilung wurde in 26 Fällen erhalten und Osteïtis verschwandt in allen Fällen. Zwei Patienten hatten eine Refraktur nach neuem Trauma, aber Heilung wurde erzielt. In zwei Fällen heilte die Fibula zu rasch, da zu wenig reseziert worden war, aber Heilung wurde nach einer Re-resektion erhalten. Einige Monate später zeigten 2 Patienten wiederum Lockerheit, aber Heilung wurde nach erneuter Verbandanlegung erzielt.

Vier Brüche heilten nicht. In allen 4 Fällen war Festigkeit erzielt worden. Ein Fall bekam eine Refraktur nach einem Trauma und musste später amputiert werden, und ein anderer behilft sich mit einer

Lederhülse. Zwei Patienten tragen noch einen Gipsverband und man erwartet, dass Heilung eintreten wird.

Die Methode ist einfach und leicht. Sie kann von weniger erfahrenen Chirurgen ausgeführt werden und erlaubt Korrektur von Fehlstellungen. Effektive Kompression der Bruchstelle wird erhalten bis die Heilung eintritt, wenn 3–4 cm der Fibula extraperiostal reseziert werden. Keinerlei Gefahr einer Infektion oder Schädigung der Gefässversorgung des Bruches ist vorhanden. Der Patient kann bald mobilisiert und entlassen werden. Die Methode kann ohne Gefahr im Falle des Verdachtes einer zweifelhaften Vereinigung vor der Entwicklung von Knochenveränderungen, die zur Pseudarthrose führen, angewendet werden. Mit dieser Methode in der Reserve könnten gewagte, primäre Operationen vermieden werden. Dies ist äusserst wichtig, da Infektion, verspätete Heilung und Entwicklung von Pseudarthrosen an Häufigkeit, seit die primäre operative Behandlung allgemeiner verwendet wird, zugenommen haben.

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