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WIRE TRACTION COMPLICATIONS ASSOCIATED WITH TREATMENT OF FEMORAL SHAFT FRACTURES

By

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The most common complications attendant upon wire traction are infection, cutting through, and nerve lesions.

Attachment at the tibial tuberosity for skeletal traction of femoral shaft fractures is considered to be adequate by most surgeons. *Böhler* (1957) said: "The use of the pin or wire—and particularly of the clamp —above the knee joint may lead to severe complications. Empyema of the knee joint, infection of the hematoma in fractures close to the knee joint followed by osteomyelitis, ankylosis of the knee joint, amputation and death have been observed."

Biebl's series (1936) comprised 255 patients treated with wire traction for different fractures. The calcaneus, the distal part of the femur, and the tibial tuberosity were the sites of application in 106, 46, and 23 cases, respectively. In 2 osteitis supervened. One of the fractures had been treated with traction through the calcaneus and the other through the distal part of the femur. No nerve lesion was noted. In *Schildt*'s investigation (1946), in which wire traction was applied 540 times for different fractures, the site of application was the distal part of the femur in 214 cases and the tibial tuberosity in 103. Altogether 52 wire traction complications were recorded; 30 cases of infection without cutting through of the wire, 18 of cutting through with or without infection, and 4 of nerve lesion. All severe complications occurred in the cases in which supracondylar traction had been employed. *Aronsson* (1950) noted infection in 15 per cent of 129 patients with intertrochanteric or pertrochanteric fractures of the femur treated with wire traction. Osteomyelitis was the immediate cause of death in 1 case. The traction had been applied through the distal part of the femur.

In the opinion of *Watson-Jones* (1955), the wire should not be ap-

plied through the distal part of the femur in skeletal traction owing to the risk of adhesions in the knee joint with resultant restriction in range of movement. The latter writer considered that the cause of adhesions is frequently low-grade infection at the pin track.

Ligament damage may develop in the knee joint as a result of prolonged traction through the tibial tuberosity, *i.e.* for longer than about 6 weeks (*Böhler* 1957). On the other hand, *Watson-Jones* (1952) stated that if traction is not carried out with too heavy weights such damage will not occur.

MATERIAL

The present investigation comprises 1,003 recent fractures of the femoral shaft in 992 patients. This is the total number of such fractures in patients 17 years old or more treated at practically all hospitals in Sweden during the three-year period 1952 to 1954.

The different methods of treatment for closed and open fractures are listed in Table 1.

TABLE 1

Survey of Different Methods of Treatment of Femoral Shaft Fractures at Swedish Hospitals During the Three-Year Period 1952 to 1954.

Method of treatment	Closed fractures		Open fractures		Total	
	no.	%	no.	%	no.	%
No treatment	9	1	3	3	12	1
Primary thigh amputation	1	0.1	2	2	3	0.3
Closed methods						
Traction	275	31	43	37	318	32
Others	10	2	1	1	11	1
Open methods						
Intramedullary nailing	392	44	43	37	435	43
Encircling wire	100	11	4	4	104	10
Plate and screws	46	5	8	7	54	5
Others	50	6	9	8	59	6
Transfixation	4	1	3	3	7	1
Total	887	100	116	100	1,003	100

Wire was chosen for traction in almost every fracture treated in that manner. The site of its application occasionally varied, but not according to any definite plan. In some instances the reason was stated to be complications.

TABLE 2

Wire Traction Complications During Hospitalization.

Duration of traction	Tibial traction no.	Type of complication						Femoral traction no.	Type of complication					
		Cutting through no.	Soft-tissue inf. no.	Bone inf. no.	Nerve lesion no.	Total			Cutting through no.	Soft-tissue inf. no.	Bone inf. no.	Nerve lesion no.	Total	
						no.	%						no.	%
≦2 weeks	279	1	2	–	1	4	1	128	4	1	–	–	5	4
>2–4 weeks	118	3	1	1	–	5	4	39	2	4	1*	–	7	18
>1–2 months	147	4	3	–	–	7	5	59	1	4	1	1	7	12
>2–3 months	88	2	–	–	–	2	2	41	2	3	–	–	5	12
>3–4 months	41	1	3	–	–	4	10	19	1	–	–	–	1	5
>4 months	11	–	–	–	–	–	–	6	–	–	–	–	–	–
Total	684	11	9	1	1	22	3	292	10	12	2	1	25	9

* Pyarthrosis + ankylosis.

This table excludes 1 complication (bone infection) which resulted from traction though the calcaneus. The traction was applied for 2 months.

Skeletal traction was used as definitive therapy for 316 fractures. In these wire traction was applied altogether 401 times—through the tibial tuberosity in 261 cases, through the distal part of the femur in 129, and through the calcaneus in 11.

Wire traction was employed before and after open reduction 604 times—through the tibial tuberosity in 423 cases, through the distal part of the femur in 163, and through the calcaneus in 18.

Infection, cutting through, and nerve lesion were the wire traction complications recorded during hospitalization. Complications occurred in 3 per cent when the wire was applied through the tibial tuberosity, and in 9 per cent through the distal part of the femur (Table 2). The difference is statistically significant ($X^2 = 12.76$, with d.f. $= 1$).

TABLE 3

Knee-Joint Flexion in Fractures treated with Traction Distributed According to the Site of Application. In these Cases the Mobility of the Joint was Normal Prior to Fracture and Probably Unaffected by Multiple Injuries.

Duration of traction	Tibial traction alone		Femoral traction alone		Both tibial and femoral traction	
	90° or more no.	Less than 90° no.	90° or more no.	Less than 90° no.	90° or more no.	Less than 90° no
≦1 month	3	–	–	1	1	–
>1–2 months	29	1	21	–	4	1
>2–3 months	35	–	18	–	5	–
>3 months	24	5	11	1	9	2

Table 3 presents the mobility of the knee joint at my follow-up examination of fracture cases treated with traction. No significant difference was found between traction through the tibial tuberosity and the distal part of the femur. Infection was observed at the attachment of the wire in 3 of 11 cases where flexion was less than 90 degrees—in 2 associated with femoral and in 1 with tibial traction.

Follow-up examination revealed that knee-joint instability which might have been connected with the fracture treatment was present in only 3 of 792 cases. Two of these fractures had been nailed (lateral instability of 15 to 20° of the extended joint in both) and one treated with traction (10° lateral instability of the extended joint). In the latter case the traction had been applied through the tibial tuberosity for 3½ months. The healing course was complicated in all 3 cases—by bone infection in 2 and by refracture in 1.

DISCUSSION

The incidence of wire traction complications during hospitalization was low, 5 per cent of 1,005 applications. This might be due to the fact that less severe complications were not noted in the case records and had been forgotten by the patients when they were interviewed on follow-up. Traction through the distal part of the femur led to more numerous and severe early complications than when it was applied through the tibial tuberosity—an observation which agrees with the views expressed by other authors.

Instability of the knee joint was not more frequent following tibial traction than after other methods of treatment. The large number of cases which form the basis for the observation lend strong support to the conclusion that traction through the tibial tuberosity does not give rise to such damage. This site of application had been employed for more than one month in 134 fractures in the follow-up series (for one to two months in 51 cases, for two to three months in 46, and for more than three months in 37). In only 1 case is there any possible relation of instability for the tibial application site. The treatment had been applied for 3½ months with adequate weights, suggesting that excessive traction was not the underlying cause.

SUMMARY

The present investigation is a study of wire traction complications of treatment for fractures of the femoral shaft applied at Swedish hospitals during the three-year period 1952 to 1954—altogether 1,005 applications. Wire traction complications during hospitalization developed less often and were less severe when the site of attachment was the tibial tuberosity instead of the distal part of the femur. The frequency of complications was 3 per cent for the former site of application and 9 per cent for the latter. In no instance could it be evidenced with certainty that traction through the tibial tuberosity led to instability in the knee joint. Consequently, the latter site of attachment should be selected.

RESUME

La présente enquête porte sur l'étude des complications consécutives à la traction par fil dans le traitement des fractures du corps fémoral appliqué par les hôpitaux suédois durant la période de trois ans, 1952 à 1954, comprenant en tout 1005 cas. Les complications de la traction

par fil durant l'hospitalisation ont été moins fréquentes et moins graves lorsque l'endroit de l'attache était le condyle tibial au lieu de la partie distale du fémur. La fréquence des complications a été de 3 pour cent pour les premiers et de 9 pour cent pour les derniers. Dans aucun cas il n'a été prouvé la traction à travers le condyle tibial entraînait l'instabilité de l'articulation du genou. Il convient par conséquent de sélectionner la partie distale du fémur comme endroit d'attache.

ZUSAMMENFASSUNG

Die vorliegende Untersuchung befasst sich mit den Komplikationen der Drahtstreckbehandlung von Oberschenkelschaftbrüchen, die während der Dreijahrsperiode 1952 bis 1954 insgesamt 1005 mal verwendet wurde. Drahtstreckkomplikationen während des Aufenthaltes im Krankenhause entwickelten sich seltener und waren weniger schwer, wenn die Extension an der tuberositas tibiæ anstatt am distalen Ende des Femurs angebracht wurde. Die Häufigkeit von Komplikationen war 3 Prozent für die ersterwähnte Methode und 9 Prozent für letztere. In keinem Falle konnte mit Sicherheit nachgewiesen werden, dass Zug an der tuberositas tibiæ zu einer Instabilitet des Kniegelenkes führte. Es sollte daher dieser Sitz für die Streckbehandlung gewählt werden.

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