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A SURVEY OF THE LATE RESULTS
IN THE TREATMENT OF FRACTURA COLLI FEMORIS
MEDIALIS A. M. WHITMAN-LÖFBERG

*With particular reference to the clinical condition of the cases
without union¹.*

By

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Amongst those who pioneered the attempts to obtain better results in the treatment of the long notorious medial collum fracture, Royal Whitman may be justly numbered. To this name can be added that of Löfberg and both are linked with the technique which Whitman initiated and which Löfberg in particular consistently practised with certain modifications over a long sequence of years. The procedure may indeed almost be called revolutionary for that time, when no specific attempts were usually made to secure union in a medial collum fracture.

The main lines of the Whitman-Löfberg treatment are well known. Its most fundamental principle is that as a rule the attempt should be made to reduce a joint to a good anatomic position which favours union.

This is regarded as achieved by reduction with extension, inward rotation, and abduction. Finally, immobilisation with plaster bandage is characteristic of the treatment.

As head of the surgical department at Malmö, Otto Löfberg conducted the treatment of fractura colli femoris for almost 30 years according to these strictly defined principles. He continued the treatment along these lines right up to his departure in 1946 and thus even after

¹ This paper was read at the meeting of the Scandinavian Orthopaedic Association—Nordisk ortopedisk Förening—on 16th June, 1950.

we began to receive favourable reports about osteosynthesis procedure. But on the one hand he considered that the results of this were not convincingly better than his own, and on the other, he had acquiesced in the gradual taking over of all fracture treatment by the orthopedic clinic in Malmö where the osteosynthesis method had already been introduced.

It is not here my intention to give a very detailed account of the results compiled from such a unique series of Löfberg-treated cases of fractura colli femoris. But the following information should be recorded.

During the last period, that of 1936-46, 407 cases of so-called collum fracture were treated in the surgical department at Malmö. 145 of these were pertrochanteric or lateral and not of great importance for our subject. *Of the remaining 262 cases, 31 died in hospital.* This gives a mortality rate of 11.8 %. This may seem quite high in comparison with the best results of osteosynthesis treatment during recent years, but greatly varying mortality figures have been announced for these. In contrast to this, the Malmö figure compares well with that which Carlqvist (1) reported in 1947 from a similar collum series without operative nailing at the surgical department in Lund, 1920-1949. He announced the figure 15.6 %. Of course these figures depend to a very great extent on how strictly the contra-indications to active treatment are fixed.

After discharge from hospital a large number of patients died. For different reasons we could not get in touch with some patients. Owing to general physical weakness a number could not conveniently be brought along for examination. So far 88 patients have been subjected to a clinical and roentgenological examination. The interval between the injury and the follow-up examination was in all cases at least 4 years.

The above reservations must be borne in mind when considering the following details.

Information about the results of the Whitman-Löfberg treatment is scanty and varying, nor is it always based upon a really painstaking investigation. One such careful investigation is found in the above-mentioned report from the surgical department in Lund 1947. *The 87 cases examined there gave an incidence of 72 % with fracture union.* Mercer (4) stated in 1947 that only in 30-40 % of the cases could union be rightly expected by means of this treatment. Although a review of the particulars of the 88 patients examined so far cannot give a *final* picture of the conditions of healing, nevertheless the following figures may be of interest in the present series.

Out of 88 patients examined in this Löfberg series 56 obtained

union, 25 did not have union, while 7 showed "partial pseudarthrosis". This last means that the cases concerned have some thin bridges of bone connecting the fragments. From the clinical standpoint all these "partially united" cases may be described as to a large extent doubtful cases of union. If it is admitted that these 7 cases nevertheless show a form of bony union between the fragments, the incidence of union in the series becomes 71.6 %, and that of pseudarthrosis formation, 28.4 %. A group has crept in amongst the 56 cases of union, however, whose placing is open to discussion, namely, types of fracture which on the roentgenogram may show either no dislocation at all or very slight valgus malposition and on which no manipulative reduction has been carried out. Out of 12 such fractures classified by roentgen examination, probably 7 could also be given the clinical diagnosis "impaction". All 12 fractures have united. If these are omitted, *the percentage of union for fractures treated actively with reduction and plaster-immobilisation (Whitman-Löfberg) equals 67.1 %*. Today, this figure does not seem very impressive but for a long time it must have been exceedingly satisfactory, if one reflects that long after the beginning of the 20th century the foremost experts still considered that these forms of collum fracture could not be united, as a rule.

Thus a short review of the existing series has been given. It is not now my intention to attempt a detailed analysis here of what this may contribute towards clearing up for example the problem concerning the genesis of pseudarthrosis colli femoris. Instead we shall follow-up the patients with un-united fractures after discharge from hospital, in order to characterize their subsequent condition and thus to receive an illustration of the importance of devoting continued attention orthopedically to these pseudarthroses.

In the clinical survey my conclusions were formed in accordance with the following principle—I tried above all to assess the patient's practical condition. This was determined on an objective basis from the following main features: shortening in the fracture and restriction of movement in the affected hip joint or other joints (usually the knee joint of the affected leg); further, muscular stability in the hip and, finally, degenerative changes arising later—for instance, aseptic necrosis or arthrosis deformans. These different features were examined and appraised. All pseudarthroses showed computable shortening, varying from 3 to 9 cm. The united fractures often exhibited no computable shortening at all; in one case, however, the shortening was 5 cm. Muscular stability was checked by Trendelenburg's test. All the pseudarthroses, as seemed probable, were positive Trendelenburg at the affected hip. The healed patients often revealed good stability with

negative Trendelenburg. Limitation of movement did not prove to be a principle symptom of the un-united fractures. Half of the cases had no such restriction of movement at all or only very slight, and only 7 had any considerable degree of restriction. The others had only small restriction which left no mark at all upon the physical status from the practical point of view. Some patients obtained rather increased mobility in one of the axes of movement on comparison with the injured side. I was not able to calculate exactly the incidence of *caput necrosis* owing to lack of continued roentgen control. Instead I give the figures for such caput changes as may be the result of either *caput necrosis* or *arthrosis deformans*. The incidence of such changes was 38 % for those with united fracture, as against 72 % for the *pseudarthrosis* cases. In the Lund series—without nailing—*Carlqvist* was not able to determine the frequency of caput necrosis in the *pseudarthrosis* cases for the same reasons as I. For united fractures he reckoned the figure "at least 24.6 %". By way of comparison it may also be mentioned, that in an osteosynthesis series *Odén* (5) found that signs of degenerative changes in the caput pointed to caput necrosis with a frequency rate of 38.4 %.

The various pathological particulars mentioned above, together result in the following practical consequences: limp to a greater or lesser degree, the dependence of the injured patient on sticks or other

Fig. 1.

No pain	+3	No claudication	+3	No cane	+3
slight pain	—1	very slight „	+2	cane occasionally	—1
moderate pain	—2	slight „	+1	cane outdoors	—2
severe pain	—3	obvious „	—1	cane indoors	—3
		severe „	—2		
		very severe „	—3		
<i>Shortening</i>			<i>Trendelenburg</i>		
0 cm =	+6	neg. =	+3	“Heavy” work	+3
1 cm =	+5	pos. =	—3	light work	+2
2 cm =	±0			self-care	+1
3 cm =	—3			incapable of self-care	—3
4 cm =	—4				
5 cm =	—5				
6 cm =	—6				

support, unfitness for work or eventually, at least, inability to take care of himself personally. Finally they form the background to the patient's subjective troubles, above all, aching and pain. Four different grades of difficulty were considered to cover actual conditions and

were marked from +3 to -3, according to the following table. (Fig.1). An assessment with reference to these qualifying particulars then gives a placing on the basis of the marks added together; this signifies the practical result of the accident and of the collum fracture, which was at least 4 years old at the time of the post-examination. The gradings extend from +12 to -12 while a dividing line between the clinically satisfactory and unsatisfactory lies at the figure ± 0 . Only a few of the un-united fracture cases succeeded in passing this low mark. Amongst the pseudarthrosis cases 84 % are thus judged unsatisfactory and only 16 % are approved according to this assessment. In contrast to this, 79 % of the united fracture cases are clinically satisfactory which means that they lead a bearable existence without aching or pain and do not need to feel themselves a burden to other people. Thus, no less than 21 % do not possess such self-sufficient standards. The graph may be represented in the following way. (Fig. 2).

By way of comparison it may be mentioned that Carlqvist (1) in his Lund series of fractures without operative nailing described 47.2 % as clinically bad, following somewhat different standards of judgement. His results are given alongside the Malmö results in the diagram below. Since Carlqvist does not include the so-called valgus fractures in these clinical results a corresponding adjustment must first be made on behalf of the Malmö series by the exclusion of the 12 fractures without reduction. (Fig. 3).

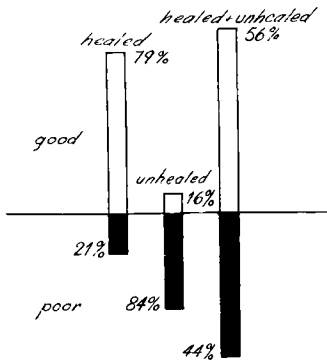


Fig. 2.

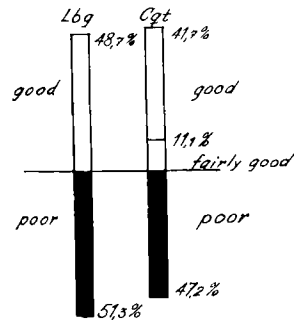


Fig. 3.

All such comparisons must obviously possess only a relative value since it is impossible to fix any objective standards of judgement. The examining doctor depends to a large extent on both the patients' and his own subjective understanding of the difficulties. The joint function

is not very often first class in these older patients, irrespective of fracture. The general condition and other diseases like polyarthrititis also play an important part. Figures can, however, give some comparative idea of the results in the different series. Thus it is interesting to see the results of some osteosynthesis series. Spotoft (9) 1944, Linton (2) 1944, and Odén (5) 1947, reported results seen in the table below. (Odén's statistics from 144 cases also include 23 valgus fractures.) (Fig. 4).

Fig. 4.

	Year	Good %	Fairly Good %	Poor %
Spotoft	1944	50.3	28.4	21.4
Linton	1944	42	32	26
Odén	1947	70	10	20

Clearly the clinical results obtained by the modern treatment of the medial collum fracture are also by no means satisfactory.

It may now be asked how these patients with un-united fractures are able to accept such an existence. Certainly most of them seem to be able to get along in some way, notwithstanding, and they may well be regarded as exemplifying nature's great capacity for adaptation. As regards their disability they have adopted the attitude which learned doctors possessed at the beginning of this century—namely, that since it is simply impossible to unite such a bone fracture, then there is nothing to be done about it. Most of them have had enough time to become convinced of this during the course of a rather long drawn-out period of after-treatment.

Of the patients without union in the series reported here some found their way nevertheless to the orthopedical clinic. It is instructive to perceive that these were in fact compelled to come to the hospital. They are actually the patients whose condition is by far the worst. It seemed to be first of all aching and pain which compelled them to make this attempt. (Fig. 5).

The possibilities we have of extending more radical aid are limited but nevertheless of value. The most usual methods consist in different forms of osteotomy, creating better weight-bearing conditions, and renewed osteosynthesis possibly with bone grafts or combinations of these procedures. By means of arthrodesis operations the patients can at least be freed of aching and pain. In recent years better conditions have been evolved for the performance of arthroplasty in certain suitable cases.

Of the 25 pseudarthrosis cases in this series 10 have received treatment at the orthopedic clinic in Malmö.

In three cases subtrochanteric osteotomy was carried out, in three cases, resection, and in three cases, osteosynthesis with metal peg on the Sven Johansson model, together with bone grafting, either simultaneously or later. In one case, only plaster and traction treatment was given for a period. All the patients improved considerably, above all, with respect to the aching and pains. In one case the result deteriorated owing to a severe polyarthrititis which the patient had had for many years, and in two cases the success was diminished owing to the patients' mental condition. The purpose of the following graph is to show the result of the orthopedical measures. In the first diagram the placing of the ten patients was indicated according to marks obtained partly before and partly after the orthopedical treatment. (Fig. 6). A

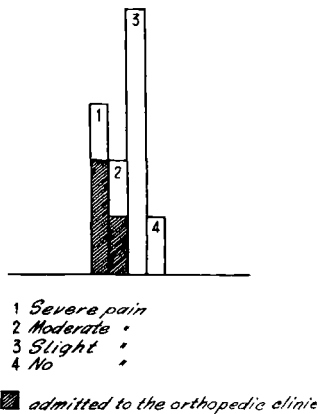


Fig. 5.

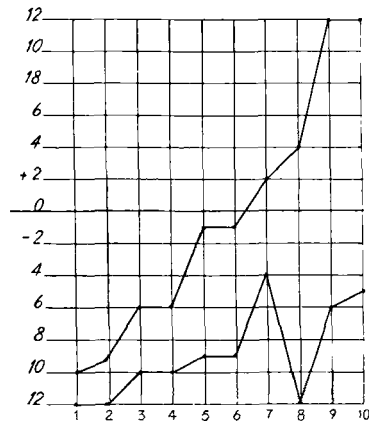


Fig. 6.

1. osteotomy.
2. resection.
3. osteotomy.
4. resection.
5. osteotomy.
6. osteosynthesis (nail and boneplate).
7. plaster cast.
8. resection.
9. osteosynthesis (nail and osteotomy).
10. osteosynthesis (nail).

curve connecting the cases as they were before the treatment lies in most instances considerably lower than a similar curve corresponding to the cases after treatment. The treatment has thus produced improvement, represented in at least several cases by a very valuable higher grading. In each case the orthopedical method employed is

given. In the following graphs it is afterwards made clear in a corresponding manner how the orthopedical measures influenced the different factors, which distinguish the patients' clinical status. (Fig. 7).

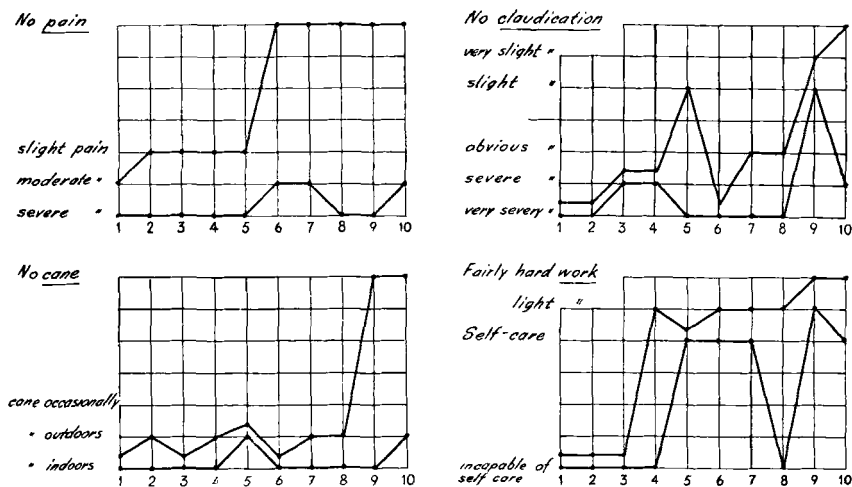


Fig. 7.

SUMMARY

Out of 262 cases of medial collum fracture which were treated by immobilisation in plaster with or without previous reduction, 31 died in hospital. Up to June 1950, 88 surviving patients—minimum observation period 4 years—had been subjected to clinical and roentgenological examination. The results of these patients gave an incidence of 67.1 % for healing in those fracture cases which were actively treated by reduction and plaster immobilisation in accordance with the Whitman-Löfberg procedure (union was obtained in all the 12 cases without dislocation or with very slight valgus malposition which had been immobilised in plaster without previous manipulative reduction). Naturally the value of the figure given is limited because nothing is known concerning the conditions of healing amongst the large number of patients who died after discharge from hospital or who for various reasons were unable to attend for a follow-up examination. The appearance of such changes in the caput as may be the result of either caput necrosis or arthrosis deformans resulted in the figure 38 % for patients with union as against 72 % for pseudarthrosis cases. Clinically the latter manifested a particularly unsatisfactory condition. The majority of the cases with union did not suffer serious invalidity

from the injury , but almost all those without union were very much troubled by aching and pain, by difficulty in walking, and inability to work. 10 out of 25 pseudarthrosis cases were obliged to attend the clinic for orthopedical treatment owing to serious disability. In 3 out of these 10 cases subtrochanteric osteotomy had been performed, in 3 cases, resection of the hip joint and in a further three, osteosynthesis with metal peg, combined with bone grafting either simultaneously or later. Finally, in one case only, a period of treatment by traction and plaster immobilisation was given. All these patients improved considerably.

RESUME

Sur 262 cas de fracture médiale du col du fémur traités par immobilisation dans le plâtre avec ou sans réduction préalable, 31 sont décédés à l'hôpital. Jusqu'en juin 1950, 88 malades survivants (avec une période d'observation minimum de 4 ans) avaient été soumis à un examen clinique et radiographique. Chez ces malades les résultats ont donné une incidence de 67,1 % de guérison pour les cas de fractures traités activement par réduction et immobilisation dans le plâtre d'après la méthode de Whitman-Löfberg (la consolidation a été obtenue dans les 12 cas sans dislocation ou avec très légère malposition valgus qui a été immobilisée dans le plâtre sans réduction manipulative préalable). Il est évident que la valeur des chiffres donnés est limitée parce que l'on ne sait rien des conditions de guérison en ce qui concerne le grand nombre des malades décédés après leur départ de l'hôpital ou qui, pour des raisons variées, n'ont pu être réexaminés. On constate l'apparition de modifications dans la tête du fémur qui sont le résultat soit d'une nécrose de la tête, soit d'une arthrose déformante, chez 38 % des malades avec consolidation, contre 72 % des cas de pseudarthroses. Au point de vue clinique, l'état de ces derniers est particulièrement peu satisfaisant. La majorité des cas chez lesquels il y avait consolidation ne souffraient pas d'invalidité sérieuse à la suite de la lésion, tandis que presque tous ceux chez lesquels il n'y avait pas de consolidation avaient des difficultés pour la marche et étaient incapables de travailler. 10 des 25 cas de pseudarthroses étaient obligés de suivre un traitement orthopédique, dans 3 cas sur 10 on avait pratiqué une ostéotomie subtrochantérienne, dans 3 cas une résection de l'articulation de la hanche et dans trois autres une ostéosynthèse avec cheville métallique, combinée de greffe osseuse soit simultanément, soit plus tard. Finalement, dans un cas seulement il a été appliqué une période de traitement avec traction et immobilisation dans le plâtre. Tous ces malades se sont considérablement améliorés.

ZUSAMMENFASSUNG

Von 262 Fällen von medialem Schenkelhalsbruch, die mit Ruhigstellung im Gipsverbande mit und ohne Einrichtung behandelt wurden, starben 31 im Krankenhaus. Bis zum Juni 1950 wurden 88 überlebende Patienten — kürzeste Beobachtungsdauer 4 Jahre — klinisch und röntgenologisch nachuntersucht. Das Ergebnis der Untersuchung war: 67,1 % Heilung in jenen Fällen, die aktiv nach der Whitman-Löfberg Methode mittels Einrichtung und Ruhigstellung im Gipsverbande behandelt wurden. (Knöcherne Vereinigung trat in allen 12 Fällen ein, die entweder keine Verschiebung oder nur sehr leichte Valgusstellung aufwiesen und die ohne vorhergehende Einrichtung im Gipsverbande ruhiggestellt worden waren). Selbstverständlich ist der Wert der gegebenen Zahl begrenzt, da nichts über den Heilungszustand der grossen Anzahl von Patienten, die nach der Entlassung starben oder die aus verschiedenen Gründen nicht zur Nachuntersuchung erscheinen konnten, bekannt ist. Veränderungen im caput femoris, die das Resultat von Caput-Nekrose oder arthrosis deformans sein konnten, wiesen sich in 38 % der Fälle mit knöcherner Vereinigung, während sie in 72 % der Pseudarthrose-Fälle vorhanden waren. Die letztere Gruppe wies klinisch ein besonders unzufriedenstellendes Ergebnis auf. Die Mehrheit der Fälle mit Heilung litt nicht an ernster Invalidität nach dem Unfall, aber beinahe alle Fälle mit Pseudarthrose waren sehr behindert durch Schmerzen, Gangschwierigkeiten und Arbeitsunfähigkeit. 10 von 25 Pseudarthrosen waren genötigt die Klinik wegen schwerer Hilflosigkeit aufzusuchen, um orthopädische Behandlung zu erhalten. Bei drei von diesen 10 Patienten war eine subtrochantere Osteotomie ausgeführt worden, in drei anderen Fällen Resektion des Hüftgelenkes, und in drei weiteren Fällen Osteosynthese mit einem Metallstift, kombiniert mit einer gleichzeitigen oder späteren Spahneimplantation. Schliesslich, war in einem Falle nur eine Behandlung mit Extension und Ruhigstellung im Gips gegeben worden. Alle diese Patienten zeigten bedeutende Besserung.

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