

ON SURGICALLY TREATED HERNIATED INTERVERTEBRAL DISCS

By

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There are many interesting aspects of the diagnosis and the treatment of protruded or herniated discs. Here an analysis is given of a review of patients operated upon at the orthopaedic department, University Hospital, Lund.

MATERIAL

The material consisted of 267 cases operated upon at the Department during the years 1945–1953. In order to keep the material as uniform as possible, only those cases were selected that were operated upon by one and the same surgeon (Professor Wiberg). Since 16 of the patients had been operated on elsewhere or by some other surgeon earlier, they were excluded. This left 251 patients, of whom 134 (53.4 %) were males and 117 (46.6 %) were females. The ages of the males ranged from 18 to 68 (mean 41.23 years), of the females from 16 to 65 (mean 38.44 years). The age distribution is compared with that of Love's (1947) material (1217 cases) and Waris's (1948) (374 cases).

TABLE 1

Age in years	Love 1947 per cent of 1217 cases	Waris 1948 per cent of 374 cases	Knutsson-Wiberg 1958 per cent of 251 cases
10–19	2.1	—	3.2
20–29	16.3	18	11.5
30–39	35.3	43	30.7
40–49	30.5	28	34.3
50–59	13.1	10	15.1
60–69	2.7	1	5.2

The protrusion was right-sided in 121, left-sided in 128 and bilateral in the remaining 2 cases.

CLINICAL FINDINGS

The clinical findings are summarized in Table 2.

TABLE 2
Clinical syndrome.

L ₄ :	8
L ₅ :	75
S ₁ :	104
L ₄ + L ₅ :	3
L ₅ + S ₁ :	39
0 syndr.:	22
Total :	251

Opinions differ on the significance of reflex changes and pareses. Spurling (1939) expressed the view that in at least 50 per cent of all patients in whom the achilles tendon reflex is impaired or absent the intervertebral disc involved is in the lumbosacral space. Craig & Walsh (1941) considered such impairment to permit no conclusion as to the level of the disc involved, an opinion shared by the Dane Malmros (1942). Sjöqvist (1942) claimed that weakness of the achilles tendon reflex was almost pathognomonic of the S₁-syndrome, and Norlén (1944) arrived at the same conclusion on the basis of his investigations in association with operations. In a series reported by Wiberg (1943), the achilles tendon reflex was found to be changed in 83 per cent of 69 patients with lumbosacral disc prolapse. The corresponding figure in Norlén's series was 89 per cent and in series of 153 patients with lumbosacral disc herniation Waris found the achilles tendon reflex to be changed as many as 94 per cent, and in a series reported by Friberg & Hult (1951) the corresponding figure was 80 per cent. Of a total of 133 prolapses of the disc between the fifth lumbar and first sacral vertebrae in the present material, the achilles reflex was weak or absent in 111, *i.e.* 83 per cent. In all of these comparisons the percentages refer to the frequency of impairment of the achilles tendon reflex among patients in whom operation had revealed prolapse of a lumbosacral intervertebral disc. A more important question from a practical point of view is to what extent weakness of the achilles tendon reflex

may indicate the localisation of the intervertebral disc prolapse. In Waris's material operation revealed lumbosacral prolapse in 69 per cent of those patients in whom the achilles tendon reflex was weak. Ståhl (1948) found lumbosacral prolapse in 80 per cent of patients with a weakened or absent achilles tendon reflex. The corresponding figure in the present material was 81 per cent.

The significance of paresis of the great toe has been stressed above all by Norlén (1944), who found such paresis in 14 per cent of 99 cases of intervertebral disc protrusion between the fourth and fifth lumbar vertebrae. The corresponding figure of Waris's series was 22 per cent, for Friberg & Hult (1951) 48 per cent, and in the present material we found certain changes in 58 cases of 82 or in almost 71 per cent. The figure might appear fictitiously high, but we would stress that we tested the power of dorsal flexion of the great toe extremely rigorously. The patient was thus requested not to raise the great toe a few times but 10–15 times, since in this way it was often possible to observe any "fatigability" on the affected side, which is sufficient evidence to classify the gross functional strength as decreased. We never found such fatigability to be due to any pain along the course of the sciatic nerve on the side affected. Of those patients in whom paresis of the great toe could be demonstrated, the operative finding was positive in 63 per cent.

Even if it is not possible to detect the exact level of the lesion by clinical methods, it is nevertheless possible to assess with a high degree of probability, in which space the root is compressed.

If it is desired to determine the site of compression with greater accuracy, it is, of course, possible to resort to myelography. At the Department, however, we have found that in clear-cut cases of symptoms of compression of the nerve root at the level of the fifth lumbar or first sacral space operation may be performed without preceding myelography. If then exploration of the intervertebral space between the fourth and fifth vertebrae in a patient with a clinical L₅-syndrome fail to reveal any lesion, exposure of the lumbosacral space requires only a slight extension of the operation. In the same way, if exposure of the sacrolumbar space is negative in a patient with a clinical S₁-syndrome, the operation can readily be extended to include inspection of the space between the fourth and fifth lumbar vertebrae.

Myelography is resorted to when the symptoms correspond with compression of two nerve roots or when the diagnosis is for some reason uncertain.

Myelography.

Myelography will not always give a clear cut diagnosis either. In the present material myelography was performed with air-oxygen in 80 cases, and might help to elucidate to what extent the myelographic findings agree with these made at operation. From table 3 it is clear that of those cases in which myelography showed disc protrusion, it was those between the fifth lumbar and first sacral vertebrae that were found with the highest frequency at operation. Only in 1 out of 10 cases did operation fail to confirm a positive myelographic evidence of protrusion of the disc between the fifth lumbar and first sacral vertebrae. This agrees with earlier experience. If myelography suggests a prolapse in the lumbosacral region where the spinal canal is particularly wide, the herniation is usually large enough to produce a filling defect in the contrast medium at the level involved. This explains why operation usually confirms roentgenographically demonstrated lumbosacral disc protrusion.

Of 38 cases in Waris's material in which the myelogram suggested a prolapse at this level, the diagnosis was confirmed at operation in 29 (76 per cent).

Of 34 cases in which myelography suggested prolapse of the disc between the fourth and fifth lumbar vertebrae in the present investigation, the finding was confirmed at operation in 26 (77 per cent). The corresponding figures given by Waris were 53 of 60 (88 per cent).

Myelography showed no signs of pathologic condition in 32 cases. Surgical exploration of the lumbosacral space revealed herniation of intervertebral disc in 9 out of 13, which confirmed what we said above, that owing to the width of the spinal canal in the lumbosacral region, myelography may fail to demonstrate slight protrusion.

As to the disc between the fourth and fifth lumbar vertebrae, operation revealed herniation in 4 of 11 cases, in which myelography had failed to detect any signs of a pathologic condition.

Myelography with water-soluble contrast medium gives more reliable results than with air-oxygen. Friberg & Hult (1951) described a series of 294 cases of which myelography (contrast: abrodil) was positive in 232 and negative in 62. They compared the roentgen findings with observations made at operation. They found that operation confirmed the myelographic findings in 92 per cent of the protrusions between the fifth lumbar and first sacral vertebrae and in 90 per cent of those between the fourth and fifth lumbar vertebrae. Of those cases in

which the myelographic appearance was normal, operation revealed protrusion in the lumbosacral space in 39 per cent and between the fourth and fifth lumbar vertebrae in 14.5 per cent.

TABLE 3

48 cases with myelographic disc protrusion (air-oxygen).

Operation confirmed myelographic finding in same space +
Operation confirmed myelographic finding in same space +

L ₃ — L ₄		L ₄ — L ₅		L ₅ — S ₁	
+	—	+	—	+	—
—	4	26	8	9	1

Of the 13 cases in which operation failed to confirm the myelographic finding in the same space, a protrusion was found in another space in 7.

32 cases with myelograms of normal appearance (air oxygen).

Protrusion found at operation + No protrusion found at operation —

L ₃ — L ₄		L ₄ — L ₅		L ₅ — S ₁		0 neurol. signs	
+	—	+	—	+	—	+	—
1	1	4	7	9	4	—	6

In 1 case myelography was non-conclusive.

TABLE 4

63 cases with myelographic (contrast U) evidence of disc protrusion.

Operation confirmed myelographic finding in same space +
Operation failed to confirm myelographic finding in same space —

L ₃ — L ₄		L ₄ — L ₅		L ₅ — S ₁	
+	—	+	—	+	—
2	1	26	2	29	3

12 cases with myelogram of normal appearance (contrast U).

L ₃ — L ₄		L ₄ — L ₅		L ₅ — S ₁	
+	—	+	—	+	—
—	—	1	—	9	2

We have also studied a series of 63 myelographic examinations in which disc protrusion had been demonstrated by the use of contrast medium U. Of 32 cases in which myelography had indicated protrusion of the disc between the fifth lumbar and first sacral vertebrae operation confirmed the roentgenographic finding in 29 (91 per cent). The corresponding figures for the disc between the fourth and fifth lumbar vertebrae were 26 (93 per cent) of 28. Concerning the disc between the fifth lumbar and first sacral vertebrae operation revealed disc protrusion in 9 out of 11 cases in which examination with the same contrast medium had failed to demonstrate any changes. In only 1 case did myelography miss a protrusion of the disc between the fourth and fifth lumbar vertebrae found at later operation. These figures confirm what we said above, i.e. that a certain degree of roentgenographic overdiagnosis and underdiagnosis must be expected.

Electromyography.

In recent years electromyography has been used to detect which disc is involved. Since it is known that paresis of the great toe is indicative of compression of the fifth lumbar root it was thought that similar paresis of the femoral quadriceps might indicate the fourth lumbar syndrome, and that of gastrocnemius the lumbosacral syndrome, as L₄ resp. S₁ is carrying motor fibres for these muscles. Electromyography can detect any denervation of the muscles and thereby reveal the presence and level of any pressure against the corresponding nerve root. Some investigators also claim that electromyography should give more reliable results than myelography.

The first to report the use of the method of electromyography in the diagnosis of intervertebral disc protrusion were Shea, Woods & Warden (1950). They showed that of 23 herniations in the intervertebral space L₄-L₅ electromyography gave a correct diagnosis in 22 and missed in only one. Myelography had demonstrated the herniation in 19 of 22 cases but missed in 3. (Myelography was not done in 1 case). As to the disc between the fifth lumbar and first sacral vertebrae electromyography revealed herniation in 30 of 35 and missed it in 5. The corresponding figures for myelography were 27 and 3. (Myelography was not done in 5 cases). Marinacci (1955) reported 71 cases of lumbosacral herniations of the intervertebral disc in which the electromyographic findings agreed with the operative findings in 67 cases. Myelography had been performed on 63 of the patients with correct diagnosis

in 33. He also described 57 cases of protrusion of the disc between the fourth and fifth lumbar vertebrae in which electromyography had shown the exact location of the lesion in 53. Myelography was made in 56 cases with correct diagnosis in 42. These two reports show that electromyography is of great value in the investigation of suspected disc herniation, especially if the myelographic findings are negative or uncertain.

At the Department of Orthopaedics, Lund, electromyography is therefore now used routinely in the investigation of herniated intervertebral disc.

TABLE 5
Operative findings.

	Males	Females	Total
Disc prolapse	105	94	199
Protrusion	13	7	20
Exploration (negative)	16	16	32
Total	134	117	251

Site of protrusion found at operation.

L ₂ -L ₃ :	1
L ₃ -L ₄ :	2
L ₄ -L ₅ :	82
L ₅ -S ₁ :	134
Total :	219

It is clear from table 5 that of the 251 cases, the disc was prolapsed in 199, protruded in 20 and of normal appearance in 32 (12.7 per cent). These 30 cases in which no lesions could be detected at operation represented a frequency agreeing well with the figures given by other authors, e.g. Senning & Sjöquist (13 per cent), Shinnors & Hamby (17 per cent), but it is somewhat higher than Friberg's 5 per cent, Malmros's 3 per cent and Waris's 4 per cent. It should, however, be borne in mind that opinions may differ regarding what should be regarded as a normal finding and what should be considered protrusion of the disc. Of the 199 cases of disc protrusion 98.5 per cent were localized between the fourth and fifth lumbar vertebrae and between the fifth lumbar and first sacral vertebrae. Only in 3 cases was the prolapse located between the second and third or third and fourth vertebrae.

The figure 98.5 per cent underlines that the majority of all herniations of vertebral discs occur between the fourth and fifth lumbar vertebrae and the fifth lumbar and first sacral vertebrae.

The operative complications (Table 6) were few, slight and transient.

TABLE 6
Complications.

	Male	Female	Total
Haematoma	7	1	8
Headache	1	0	1
Thrombosis	1	2	3
Infection	2	2	4
Secretion	1	4	5
Fever	2	0	2
Fistula of spinal canal	0	2	2
Total	14	11	25

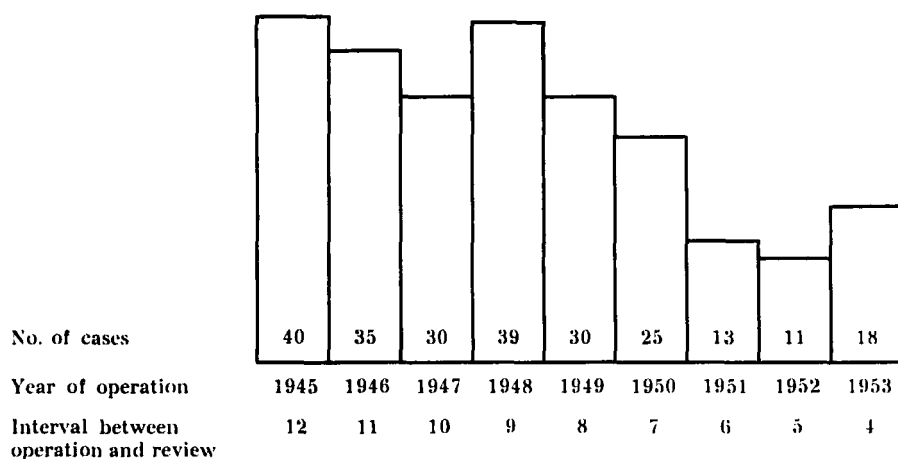
THE REVIEW

In a review of patients operated upon for sciatica exact evaluation of the effect of operation may sometimes be difficult because the examiner must rely to a great extent on the patient's personal opinion. Opinions must differ on the effect of the operation; one patient may at the time of the operation have had severe acute sciatica, while another might have been in a more chronic condition. Operations may have helped both, but there might be a considerable difference in the opinions of the relief obtained by the operation.

The composition of the material also plays an important role, the composition of a series collected from a neurosurgical department often differing widely from that of the clientele of an orthopaedic department. In addition, the indications may differ from one hospital to another, which also influences the end results. Finally, the examiner's opinion of what shall be classified as good, improved, unimproved or poor must also influence the results. This implies that comparison of results achieved in different hospitals may be misleading.

A personal review of the patients would, of course, have been more reliable, than one based on questionnaires, since it gives the examiner the opportunity of forming a more precise opinion of the symptoms and of noting any signs of interest. We have not, however, had the opportunity of performing such a time-consuming investigation.

TABLE 7



All 251 patients received a questionnaire and 241 (96 per cent) replied. The time of the review is given schematically in Fig. 7.

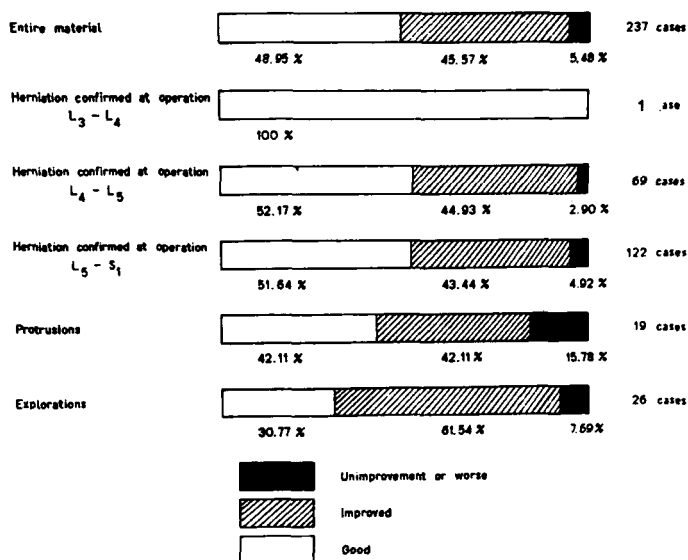
It might be objected that the interval of 4 years between the operation and the review was too short because improvement or deterioration might occur even later. However, this interval is longer than in most investigations of this type.

Of the 241 patients who co-operated, 130 were males and 111 females. Four of the patients have since died. This reduced the material to 237.

Before accounting for the results of the present material, it might be convenient to summarize those from other series on record.

In Grant's series from 1946, the two first groups (good and improved) represented 92 per cent. The remaining 8 per cent were classified as unchanged or worse. Grant claims that the results vary with the interval between operation and review and that the later the review the better the results. In Waris's large material of 374 cases, 91 per cent were classified as good or improved, 6 per cent as unimproved or worse, and 2 per cent were reoperated upon. Spurling & Grantham gave less good results, 79 per cent in the first 2 groups, and 21 per cent in the last 2, and Wiberg and Ståhl (1951) gave 75 per cent in the first two groups. Senning & Sjöqvist reported improvement in 92.7 per cent, and Love in 90.4 per cent, and Barr in 90 per cent. Of particular interest is a series reported by Marble & Bishop from 1945. Of 496 cases, selected from an insurance material, they found that only 47 per cent could be regarded as good or improved, while as many as 53 per cent were still

TABLE 8



unable to return to work 12 months after the operation. Aitken & Bredford, who also studied a series of insurance patients, found similar frequencies.

In the present investigation attention was directed only to the effect of the operation on the symptoms of sciatica. It is clear from Table 8 that improvement was reported by as many as 94.5 per cent. The figure is thus higher than what is usually given, but this must be seen in the light of the fact that, as already mentioned, this figure refers only to sciatic pain, while earlier investigators judged the patient's condition with regard to radiating pain as well as back pain.

It is apparent from the table that the results obtained among patients with definite prolapse of an intervertebral disc were more favourable than those in which disc was only protruded or in whom operation revealed no signs of pathologic condition.

A question that then presents itself is why the results were so poor in the 7 patients in whom an intervertebral disc was definitely prolapsed. In some cases, this could be explained by the observation at reoperation that scar tissue had formed round the previously exposed nerve root, which had given rise to sciatic pain. It is also possible that a disc might have protruded post-operatively and compressed the nerve root with consequent pain.

In the present material, 25 patients were reoperated upon. In 7 of these fusion was performed because of persistent back pain. Of the remaining 18 patients 17 were reoperated upon for sciatic pain once and in one case twice. Of these 5 had a true recurrence with a new prolapse of the same disc. In 4, another disc had prolapsed, but on the same side: in 5, the same disc or another had prolapsed but on the other side. In one case, scar tissue was found round the nerve root and of the remaining 4 cases, protrusion was seen in 2 cases but in the other 2 cases operation revealed no signs of a pathologic condition.

Since back trouble is not uncommon among patients operated upon for sciatica, some surgeons have suggested that the operation should be extended to include stabilisation of the lower lumbar spine by fusion, for example. Good results of such primary fusion have been claimed by Mixter and Barr in the U.S.A. and by Rovig in Scandinavia, while Spurling & Grantham, Marble & Bishop and, in Sweden, Unander-Scharin did not find the results to be particularly good. In none of our patients was primary fusion performed: we share the opinion of Spurling & Grantham that such a measure should only be resorted to in the event of permanent back pain.

Another point on which we tried to obtain information was how long the patient had been convalescent, after the operation. Although the patients could not always say exactly how long they had been away from work, the data given were sufficient to form a fairly good idea of the period they had required to recover. This interval varied between 6 weeks and 1 year, but only in 1 case did recovery require such a long time as 1 year. This patient was a 19 year old girl and cannot be regarded as representative. If this case is excluded, the average period of convalescence was 4.3 months for the males and 4.2 months for the females. But even this is a remarkably long time and approaches the figures given by Marble & Bishop for their insurance patients. If we divide the material into 3 groups: prolapse, protrusion and exploration, it will be seen that, as expected, convalescence was shortest for the first group and longest for the last. It is, however, not known whether these long periods of convalescence were due to sciatic pain or back pain trouble.

The results of operation can also be estimated to a certain extent by the fact whether the patient was able to return to his usual work or whether he was obliged to change his occupation. In the present material 18 patients (11 males and 7 females) took up lighter work after the operation.

SUMMARY

In an analysis of the clinical, myelographic and operative findings in a series of 251 patients operated upon at the Department of Orthopaedics, University Hospital, Lund, the following observations of interest were made.

Weakness in dorsal flexion of the great toe was noted in almost 71 per cent of the patients in whom operation revealed protrusion or prolapse of the disc between the fourth and fifth lumbar vertebrae.

Of those patients with paresis of the great toe operation revealed protrusion or prolapse of the disc between the fourth and fifth lumbar vertebrae in 63 per cent.

Of those in whom operation revealed protrusion or prolapse of the disc between the fifth lumbar and first sacral vertebrae, the achilles tendon reflex was impaired or absent in 83 per cent.

Of those in whom clinical examination revealed impairment or absence of the achilles tendon reflex, operation revealed protrusion or prolapse of the disc between the fifth lumbar and first sacral vertebrae in 81 per cent.

Of those in whom myelography (air-oxygen or contrast U) showed a protrusion between the fourth and fifth lumbar vertebrae, operation confirmed the finding in 77 per cent (contrast U in 93 per cent). The corresponding figures for the disc between the fifth lumbar and first sacral vertebrae were 90 per cent (with contrast U 91 per cent).

Operation revealed protrusion or prolapse of the disc between the fourth and fifth lumbar vertebrae in 36 per cent and between the fifth lumbar and first sacral vertebrae in 69 per cent of those cases in which myelography with air-oxygen had shown no signs of pathologic condition.

Operation revealed protrusion or prolapse of the disc between the fourth and fifth lumbar vertebrae in 1 case and between the fifth lumbar and first sacral vertebrae in 9 out of 12 cases of myelography with contrast U, which showed no signs of pathologic condition.

The use of electromyography in the diagnosis of the level of the lesion is discussed.

An interview was made by questionnaire of 241 of 251 patients who had been operated upon 4 – 12 years previously.

Improvement was reported by 94.5 per cent, the remaining 5.5 per cent reported no change or deterioration. The results are compared with those of earlier authors.

The reoperated cases and the duration of convalescence are discussed.

RESUME

Dans une analyse des trouvailles cliniques, myélographiques et opératoires d'une série de 251 malades opérés dans le Service d'Orthopédie de l'Hôpital de l'Université de Lund, les observations suivantes qui présentent de l'intérêt ont été faites.

Une faiblesse dans la flexion dorsale du gros orteil a été constatée dans presque 71% des cas chez lesquels l'opération a révélé une protrusion ou un prolapsus discal entre la 4ème et la 5ème vertèbre lombaire.

Chez les malades présentant une parésie du gros orteil, l'opération a révélé une protrusion ou un prolapsus discal entre la 4ème et la 5ème vertèbre lombaire dans 63% des cas.

Chez ceux chez lesquels l'opération a révélé une protrusion ou un prolapsus discal entre la 5ème vertèbre lombaire et la 1ère vertèbre sacrée, le réflexe achilléen était altéré ou aboli dans 83 % des cas.

Chez ceux chez lesquels l'examen clinique a fait observé une altération ou une abolition du réflexe achilléen, l'opération a révélé une protrusion ou un prolapsus discal entre la 5ème vertèbre lombaire et la 1ère vertèbre sacrée dans 81% des cas.

Chez ceux chez lesquels la myélographie (oxygène ou contraste U) a montré une protrusion entre la 4ème et la 5ème vertèbre lombaire, l'opération a confirmé la trouvaille dans 77% des cas (contraste U dans 93%). Les données correspondantes pour le disque entre la 5ème vertèbre lombaire et la 1ère vertèbre sacrée étaient 90% (avec contraste U 91%).

L'opération a révélé la protrusion ou le prolapsus discal entre la 4ème et la 5ème vertèbre lombaire dans 36% des cas et entre la 5ème vertèbre lombaire et la 1ère vertèbre sacrée dans 69% des cas lorsque la myélographie à l'oxygène n'a montré aucun signe d'état pathologique.

L'opération a révélé la protrusion ou le prolapsus discal entre la 5ème et la 1ère vertèbre sacrée dans 9 cas sur 12 de myélographie avec contraste U chez lesquels il n'y avait aucun signe d'état pathologique.

L'usage de la électromyographie pour poser le diagnostic du niveau de la lésion est discuté.

L'enquête a été effectuée à l'aide de questionnaires pour 241 des 251 malades qui accrient été opérés entre 4 et 12 ans auparavant.

Une amélioration a été rapportée dans 94.5% des cas, 5.5% n'ayant rapporté aucun changement ou aggravation. Les résultats sont comparés à ceux antérieurement obtenus par d'autres auteurs.

Les cas réopérés et la durée de la convalescence sont discutés.

ZUSAMMENFASSUNG

An Hand einer Analyse der klinischen, myelographischen und operativen Befunde in einer Reihe von 251 Patienten, die an der orthopädischen Abteilung des Universitätskrankenhauses in Lund operiert worden waren, wurden folgende, wesentliche Beobachtungen gemacht.

Schwächung der Dorsalflexion der grossen Zehe wurde bei fast 71 procent der Patienten, bei welchen die Operation eine Vorwölbung oder einen Vorfall der Bandscheibe zwischen viertem und fünftem Lendenwirbel aufwies, gesehen.

Bei Patienten, die eine Parese der Grosszehe hatten, wies die Operation eine Vorwölbung oder einen Vorfall der Bandscheibe zwischen viertem und fünftem Lendenwirbel in 63 % auf.

Bei jenen, die anlässlich der Operation eine Vorwölbung oder einen Vorfall der Bandscheibe zwischen fünftem Lenden- und erstem Kreuzbeinwirbel vorwiesen, war der Achillessehnenreflex in 83 % geschwächt oder abwesend.

Bei jenen, die während der klinischen Untersuchung einen geschwächten oder fehlenden Achillessehnenreflex zeigten, offenbarte die Operation eine Vorwölbung oder einen Vorfall der Bandscheibe zwischen fünftem Lenden- und erstem Kreuzbeinwirbel in 81 %.

Bei Patienten, die bei der Myelographie (Luft-Sauerstoff oder Kontrast U) eine Vorwölbung zwischen dem viertem und fünftem Lendenwirbel zeigte, bestätigte die Operation den Befund in 77 % (mit Kontrast U in 91 %).

Die Operation offenbarte eine Vorwölbung oder einen Vorfall der Bandscheibe zwischen viertem und fünftem Lendenwirbel in 36 % und zwischen fünftem Lenden- und erstem Kreuzbeinwirbel in 69 % bei jenen Fällen, bei denen Myelographie mit Luft-Sauerstoff keine Zeichen eines pathologischen Zustandes gegeben hatte.

Die Operation zeigte Vorwölbung oder Vorfall der Bandscheibe zwischen fünftem Lendenwirbel und ersten Kreuzbeinwirbel in 9 von 12 Fällen von Myelographie mit Kontrast U auf, die keine Zeichen pathologischer Veränderungen vorgewiesen hatten.

Die Verwendung der Elektromyographie zur Diagnose der Höhe des Schadens wird besprochen.

Von einer Gesamtzahl von 251 Patienten, die vor 4–12 Jahren operiert worden waren, wurden 241 mittels Fragebogen nachuntersucht.

Besserung wurde von 95,5 % mitgeteilt. Die übrigen 5,5 % gaben entweder keine Veränderung oder Verschlechterung des Leidens an. Die Ergebnisse werden mit denen früherer Autoren verglichen.

Die reoperierten Fälle und die Dauer der Rekonvaleszens wird besprochen.

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