FROM THE ORTHOPAEDIC CLINIC OF THE KAROLINSKA INSTITUTE.
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THE RESULTS OF LUMBAR FUSION IN DISC DEGENERATION

BY

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Most cases of prolonged and severe lumbago are due to disc degeneration. In the early stage of degeneration no radiographic changes can be seen. Later there appear instability of the degenerated disc and gradually reduction of the disc space and sclerosis of the edges of the vertebral body. Finally the disc is replaced by scar tissue, or forms a bony junction between the vertebral bodies. The instability then disappears, and with it most of the pain.

Usually lumbago can be controlled by conservative treatment, but there is a group of patients in whom it is not affected. At the Orthopedic Clinic of the Karolinska Institute, these patients have, since 1937, been treated by lumbar fusion.

They are being followed-up, and, so far, 46 cases have been examined; 5 could not be seen. The period of observation has in no case been less than one year.

The material consists of 21 men and 25 women. 22 had been doing heavy physical work, 13 light physical work, and 11 no physical work.

The average duration of the complaint before operation was 12 years for the men, and 9 years for the women. The longest time was 26 years, and the shortest 2 years.

9 patients had been able to do their full work before the operation; 12 had been more or less incapacitated intermittent-

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ly; 25 had been wholly incapacitated for an average of 19 months. The longest period of incapacity was 6 years. Most of the patients had had severe discomfort.

All the patients had been treated conservatively without improvement for varying periods. In addition, 11 had already had laminectomies for root compression, in 7 of these herniated discs had been excised, while in 4 there had been no evidence of root pressure at operation.

All cases showed radiographic signs of disc degeneration; these were:

1. Reduced intervertebral space.
2. Sclerosis of the edges of the vertebral bodies.
3. Retroposition of the vertebra above the disc.
4. Instabilty (not tested in all cases).
5. Vacuum phenomenon in the disc substance (observed only in 3 cases).

The average at operation was 39 years, the oldest patient being 53 and the youngest 24 years old.

The site of the disc degeneration was the following:

L3-L4	1		
L4-L5	7		
L5-S1	16	Single disc degeneration	24
L3-L4-L5	5	Multiple „ „	22
L4-L5-S1	12		
L3-L4-L5-S1	5		

For the operation a graft was taken from the anterior surface of the tibia and fixed onto either the spinous processes or the arches, with its lower end resting on the sacrum, irrespective of which disc was degenerated. Only in the one case where the degeneration was in the third lumbar disc was the graft placed between L3 and L4.

At first the operation was performed according to Albee's method, with the graft on the spinous processes. This method was later modified so that the arches were also fused. In some cases also the intervertebral joints were arthrodesed.

In most cases the graft was laid in the angle between the

spinous processes and the arches, either on one or both sides and, in some cases, this was combined with arthrodesis of the intervertebral joints.

Recently a pronged or locking graft has been used and laid between the spinous processes.

In 12 cases laminectomy was done together with the grafting operation, but in only one case could a prolapsed disc be removed.

No postoperative complications worth mentioning have been encountered. There was no death. The patients lay in a plaster bed for 8 to 12 weeks, and then were fitted with a plaster jacket, which was worn for about 3 months. They were then supplied with a cloth or leather corset which was worn for a varying length of time. The average period for which they were unable to work after discharge from hospital was 7 months.

Follow-up examination gave the following results:

Subjectively good result and fit for work (4 in lighter work than before operation) ..... 30 (65.2 %)
Subjectively improved and fit for work ..... 3 (6.5 %)
Subjectively worse than before operation ..... 13 (28.3 %)

Among the bad results are found the following complications either alone or several together.

9 cases had had more or less extensive laminectomies; of these 4 had had 2 laminectomies, one 3, and one 4.

In 3 cases there was pseudarthrosis of the graft.

In 2 cases there was unsatisfactory fixation of the graft.

In 1 case there was necrosis of the graft, which was later excised.

If the results are studied in relation to the level of disc degeneration we find the following:

Of 16 cases with degeneration of the disc between L5 and S1 there are 15 good, and 1 bad result.

Of 7 cases with degeneration of the disc between L4 and L5 there are 4 good ,and 1 bad result.

Of 22 cases with multiple disc degeneration there are 10 good, 3 improved, and 9 bad results.

The radiographic examinations made for this investigation included a trial of the stability except in those cases where the spine was too rigid to allow it. The following results were obtained:

A. Sound consolidation of the graft 44
   1. Perfect union. Graft intact. (22 cases tested for stability. All stable) 27
   2. Fracture of the graft 8
      a) with persisting pseudarthrosis. (5 cases tested for stability. All stable) 7
      b) with bony union. (Stable) 1
   3. Pseudarthrosis of the graft at its upper contact. (2 cases tested for stability. Stable) 4
   4. Pseudarthrosis of the graft—pseudarthrosis at its upper contact—new? disc degeneration above the graft, (No test for stability) 2
   5. Graft well consolidated with new? disc degeneration above the graft. (Stability in the disc fixed by the graft, but instability in the new degenerated disc) 2
   6. No consolidation of the graft. (Unstable) 1
B. Necrosis of the graft, which was excised. (Stable) 2

It is difficult to determine with certainty what was the cause of the bad results in some of the cases. The complications which occurred in the bad cases were also found in some of the successful cases. But it seems that the results were worse in the cases in which one or more laminectomies had been done, and in those in which the degenerated disc was above the 5th lumbar vertebra.

CONCLUSIONS

1. Lumbar fusion secured freedom from pain and full working capacity in many cases of disc degeneration which had not improved with conservative treatment.
2. The best results seem to be obtained in cases of degeneration of the lumbosacral discs alone; the worst results with

degeneration of the disc between the 4th and 5th lumbar vertebrae, and with multiple disc degeneration.

3. Extensive laminectomies lead to worse results partly due to the less good fixation of the graft in these cases, and partly to the fact that the scar tissue and callus can come in contact with the dura and cause pressure and adhesions. Therefore only small laminectomies should be done in cases where fusion may be necessary.
4. Radiographic examination in cases of disc degeneration should always include a test for stability so that an incipient degeneration is not overlooked.

SUMMARY

The author has followed-up 46 patients treated for severe low back pain by fusion of the lumbar spine. All the cases showed definite radiographic evidence of disc degeneration in one or more discs.

65.2 % had no complaints, 6.5 % were improved, and 28.3 % showed no improvement. The observation period was in no case less than 1 year after discharge from hospital.

The result was best when there was degeneration in the lumbosacral disc, and worst with degeneration above the lumbosacral disc and multiple degeneration, and where big laminectomies had been done before or at the beginning of the fusion.

Necrosis of the graft, which had to be removed, occurred in 2 cases, fracture of the graft in 10 and pseudarthrosis at the upper end of the graft in 6. A new disc degeneration occurred above the graft in 4 cases.

Grafts and chips from the tibia were used. The graft was laid either on the spinous processes or in the angle between the processes and the arches, with its lower end resting on the sacrum. Arthrodesis of the intervertebral joints was done in some cases. The patient lay in a plaster bed for 3 months and afterwards wore a plaster jacket for 6 months.

RESUME

L'auteur a examiné 46 malades traités par spondylodèse de la colonne lombaire à la suite de violentes douleurs. Dans tous les cas, la radiographie montrait clairement qu'il y avait dégénération d'un ou de plusieurs disques.

Dans 65,2 % des cas, les malades n'avaient plus à se plaindre, 6,5 % ont été améliorés et dans 28,3 % il n'y avait pas d'amélioration. La période d'observation n'a pas été inférieure à un an après le départ de l'hôpital.

Les meilleurs résultats ont été obtenus quand il y avait dégénération du disque intervertébral lombo-sacré, les plus mauvais quand il y avait dégénération au-dessus du disque lombo-sacré ou dégénérations multiples où il a fallu pratiquer de grosses laminectomies au début ou avant la spondylodèse.

Dans 2 cas on a constaté une nécrose de la greffe qu'il a fallu enlever, dans 10 il y a eu fracture de la greffe et dans 6 une pseudarthrose de la partie supérieure de la greffe. Dans 4 cas, on a observé une nouvelle dégénération du disque au-dessus de la greffe.

Des greffes et des copeaux de tibia ont été utilisés. La greffe a été soit conduite dans le processus spinal, soit dans l'angle entre le processus et les arcs, son extrémité inférieure reposant sur le sacrum. L'arthrodèse des articulations intervertébrales a été pratiquée dans certains cas. Le malade est resté dans un lit de plâtre pendant 3 mois et a porté ensuite un corset de plâtre pendant 6 mois.

ZUSAMMENFASSUNG

Verfasser hat 46 Patienten, die wegen schwerer Rückenschmerzen mit Spondylodese der Lendenwirbelsäule behandelt worden waren, nachuntersucht. Alle Fälle zeigten deutliche röntgenologische Beweise einer Discusdegeneration in einem oder mehreren Disci.

65,2 % hatten keine Beschwerden, 6,5 % waren gebessert, und 28,3 % zeigten keine Besserung. Die Beobachtungszeit

war in keinem Falle geringer als 1 Jahr nach der Entlassung aus dem Krankenhause.

Das Ergebnis war am besten, wenn eine Degeneration des Lumbodorsaldiscus bestand, und am schlechtesten bei einer Degeneration oberhalb des Lumbodorsaldiscus und bei multipler Degeneration, und wo grosse Laminektomien zu Beginn oder vor der Spondylodese vorgenomen worden waren.

Eine Nekrose der Spange, so dass diese entfernt werden musste, kam in 2 Fällen vor, eine Fraktur der Spange in 10 Fällen und eine Pseudarthrosis am oberen Ende der Spange in 6 Fällen. Eine neue Discusdegeneration entstand oberhalb der Spange in 4 Fällen.

Es wurden Spangen und Späne aus der Tibia benutzt. Die Spange wurde entweder in die Processus spinosos eingepflanzt oder in den Winkel zwischen den Processis spinosis und den Bögen, so dass sie mit ihrem unteren Ende auf dem os sacrum auflag. In einigen Fällen wurde eine Arthrodese der Intervertebralgelenke vorgenommen. Der Patient lag 3 Monate in einem Gipsbett und trug danach 6 Monate lang ein Gipskorsett.