CLINICAL REVIEW

The results of surgery for low back and leg pain due to presumptive prolapsed intervertebral disc

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Summary

Fifty-six patients who had undergone fifty-seven operations for low back and leg pain thought to be associated with a prolapsed intervertebral disc have been reviewed. Forty-two had only mild residual signs and symptoms or none at all.

The patients selected for surgery were those with intractable signs and symptoms which had not improved with conservative treatment, and some were chronic low back invalids.

Myelography is a desirable adjunct in some patients when localization or diagnosis is in doubt.

In addition to the forty-two patients who had a successful outcome, five patients were improved and five who eventually had recurrences were successful at first. The figures therefore show that some measure of relief resulted from fifty-two out of fifty-seven operations performed.

The results of operation for carefully selected patients with presumptive prolapsed lumbar intervertebral disc are good. The operation is expected to relieve leg pain but more than half the patients will continue to have some discomfort or paraesthesiae. More relief from backache occurs than might be expected in view of the pathology and nature of the surgical procedure.

Most patients can return to their former occupation even though arduous.

Those accustomed to wear low back supports for years are able to stop doing so after surgery.

A small proportion of patients with initial successful results develop recurrence of back and leg symptoms. Most subside with conservative treatment and may arise from rupture of adhesions but re-exploration is sometimes necessary.

The results after the fenestration operation were not convincingly superior to those after laminectomy. Bearing in mind that the fenestration procedure was usually done on those with clear-cut signs and positive localization, it does not appear that there is anything to be gained by doing this rather more difficult operation.

FIFTY-SIX patients who had undergone surgery for relief of symptoms thought to result from prolapsed intervertebral disc in the low back region have been reviewed. They formed a consecutive series of patients operated on for this reason over a 5-year period by one of three orthopaedic surgeons serving a population of half a million people. The last patient in the series was operated on a year before the review began.

A simple calculation shows that in the series one patient per fifteen thousand population is likely to undergo surgery for prolapsed lumbar intervertebral disc per annum.

Conservative treatment

As a general rule, patients had been advised bed rest at home by their own doctors before referral to an orthopaedic surgeon. The majority of those in the review had sufficiently severe symptoms to be admitted to hospital on the 'low back regime'. This consisted of lying in bed on the back, front or sides. Going to the toilet on a wheelchair was discouraged, but the Ward Sister could allow this at her discretion. Analgesics such as codeine compound tablets were available when necessary and patients often found Sonalgin tablets helpful when attempting to sleep at night. Some patients had sufficiently severe suffering on admission to necessitate 100 mg pethidine by injection at intervals, but this was seldom necessary after 48 hr. When severe pain persisted the foot of the bed was raised and 5 lb skin traction applied to both legs. Most patients on the low back regime underwent intermittent lumbar traction in the Department of Physical Medicine. No conclusions have been drawn concerning its efficacy. In some patients it seemed to relieve their sufferings; in others it had to be discontinued as it accentuated their pain, and in others no effect was noticeable. During this period the low back region was X-rayed if this investigation had not already been carried out, and routine blood tests were made, mainly for the purpose of excluding infective or neoplastic conditions. The routine tests

TABLE 1. Preliminary signs

No.	SLR		Reflexes				Motor	Sensory	Posture
	R	L	RK	LK	RA	LA			
1	90	50	+	+	+	0	Weakness dorsiflexion L. foot	Paraesthesiae both feet	Normal
2	50	50	+	+	+	+	Normal	Normal	Normal
3	80	20	+	+	+	+	Normal	Normal	Scoliosis
4	30	75	+	+	+	+	Normal	Impairment outer R. foot	Normal
5	70	70	+	+	+	+	Normal	Normal	Normal
6	70	70	+	+	+	+	Normal	Normal	Normal
7	80	10	+	+	+	+	Normal	Normal	Scoliosis
8	60	20	+	+	+	+	Normal	Normal	Scoliosis
9	90	90	+	+	+	+	Normal	Normal	Scoliosis
10	20	20	+	+	+	+	Weakness of toe extensors	Impairment over dorsum of foot	Scoliosis
11	40	80	+	+	0	+	Normal	Normal	Scoliosis
12	90	70	+	+	+	0	Weakness plantar flexion L. foot	Analgesia outer L. calf	Scoliosis
13	60	60	+	+	+	+	Normal	Normal	Scoliosis
14	45	45	+	+	0	0	Paralysis L. peroneii	Anaesthesia both buttocks and outer side L. foot	Not noted
15	40	70	+	+	+	+	Slight weakness extensors of toes	Impairment over dorsum of foot	Scoliosis
16	50	70	+	+	+	+	Wasting R. thigh	Normal	Scoliosis
17	20	90	+	+	0	+	Normal	Paraesthesiae outer R. sole	Scoliosis
18	40	60	+	+	+	+	Normal	Normal	Scoliosis
19	15	30	+	+	+	+	Weakness of dorsiflexion of toes	Analgesia L. calf	Scoliosis
20	90	90	+	+	+	+	Normal	Normal	Normal
21	80	40	+	+	+	+	Normal	Normal	Scoliosis
22	30	30	+	+	+	+	Weakness of L. toe extensors	Sensory loss inner L. hallux	Scoliosis
23	40	80	+	+	0	+	Normal	Analgesia outer R. foot	Scoliosis
24	35	70	+	+	0	+	Normal	Normal	Normal
25 a.	60	30	+	+	+	+	Normal	Normal	Normal
b.	70	45	+	+	+	+	Normal	Normal	Normal
26	90	15	+	+	+	0	Weakness of L. toe flexion	Impairment over dorsum of foot	Scoliosis
27	80	50	+	+	+	+	Normal	Tingling soles of feet	Scoliosis
28	70	15	+	+	+	+	Normal	Normal	Scoliosis
29	20	30	+	+	+	+	Weakness dorsiflexion R. big toe and foot	Normal	Scoliosis
30	80	40	+	+	+	0	Normal	Normal	Scoliosis
31	60	80	+	+	+	+	Normal	Normal	Scoliosis
32	10	5	+	+	+	+	Normal	Normal	Scoliosis
33	90	30	+	+	+	+	Normal	Normal	Scoliosis
34	30	70	+	+	0	+	Normal	Analgesia outer R. foot	Scoliosis
35	35	45	+	+	+	+	Weakness of R. toe extensor	Normal	Scoliosis
36	90	90	+	+	+	+	Normal	Normal	Scoliosis
37	45	90	+	+	0	+	Whole of R. leg weak	Normal	Normal
38	20	75	+	+	0	+	Normal	Numb outer R. foot	Not noted
39	30	70	+	+	+	+	Normal	Normal	Scoliosis
40	40	40	+	+	0	+	Normal	Tingling outer R. foot	Normal
41	50	35	+	+	+	+	Foot drop	Diminished outer R. thigh	Normal
42	35	50	+	+	+	+	Weakness R. toes extensors	Normal	Scoliosis
43	30	90	+	+	+	+	Normal	Normal	
44	85	45	+	+	+	+	Weakness L. toes extensors	Normal	Scoliosis
45	35	35	0	0	0	0	Normal	Diminished outer L. foot	Normal
46	25	10	++	+	+	+	Normal	Precipitancy of micturition	
47	30	20	+	+	+	+	Normal	Diminished outer L. foot	Scoliosis
48	0	15	+	+	+	++	Normal	Normal	Normal
49	15	30	+	+	+	+	Normal	Normal	Scoliosis
50	40	80	+	+	++	+	Normal	Normal	Scoliosis
51	10	10	+	+	+	+	Weak dorsiflexion L. foot	Normal	Normal
52	20	70	0	+	++	+	Normal	Normal	Scoliosis
53	70	45	+	+	+	0	Normal	Normal	Scoliosis
54	15	45	+	+	+	+	Normal	Normal	Scoliosis
55	10	45	+	+	+	+	Normal	Normal	Normal
56	70	90	+	+	+	+	Normal	Normal	Scoliosis

were: ESR, WBC and differential, WR, alkaline phosphatase, and in addition acid phosphatase investigation in the case of men. A routine urine test was undertaken.

Those patients who responded to this regime to the extent that straight-leg-raising on both sides became painless up to about 60° got up and went home, usually in a suspension low back plaster, but occasionally in a lumbo-sacral support. Plaster of Paris treatment, if it gave relief, was continued for 6 weeks and followed by the use of a lumbo-sacral support for a varying period according to the symptoms and the individual's activities.

Selection of patients for surgery

Those whose symptoms did not respond to the low back regime were considered candidates for surgery. The group in whom clear-cut signs of a lateral lumbo-sacral prolapse persisted, consisting of: absent ankle jerk, analgesia of the outer side of the foot and severe limitation of straight-leg-raising, combined with the presence of scoliosis, were advised operation. They were told that the operation was for leg pain, that at least four out of five operated on could expect relief, and that experience showed that patients were not worsened by this operation. One felt confident in advising operation, knowing the tendency to chronic low back invalidism in those with these signs and symptoms who were not relieved by conservative treatment but who refused surgery.

Patients in whom the signs were less definite were further investigated by myelography and the opinion of a neurologist was often sought.

Surgical procedure

During the surgical procedure on patients whose clinical or myelographic findings indicated a definite entity at a known level, a fenestration operation was undertaken, and if a prolapsed disc was found at that level it would be removed and no further exploration carried out. In patients in whom there was an exploratory facet to the operation at least one spinous process and hemilamina would be removed. More than one disc space and nerve root might be explored. Adverse reactions to the removal of one or more laminae and spinous processes were not noted. During the convalescent period, pain was a notable feature for 2 or 3 days and patients had to be helped to move and needed pain-relieving drugs. When the convalescence was straightforward, patients sat out of bed for half an hour on the fifth post-operative day and went home a few days after stitch removal on the tenth post-operative day.

Most patients had worn a low back support before operation but were advised not to use this device afterwards.

About 2 months usually elapsed after surgery before return to work.

The main pre-operative clinical signs were obtained from each patient's records and are shown in Table 1.

Patients designated by a number in bold type are those who did not attend the review.

The review

There were fifty-seven explorations in fifty-six patients. The patient who underwent two operations

TABLE 2. Summary of the pre-operative abnormal neurological signs in those who attended for review

Abnormal pre-operative neurological signs	
None	16
Tendon reflexes only	7
Tendon reflexes, power and sensation	6
Tendon reflexes and sensation	4
Tendon reflexes and power	2
Power only	2
Sensation only	2
Power and sensation	2
Total	41

TABLE 3.

Scoliosis before operation

Present	29
Absent	10
Not mentioned in records	2
Total	41

TABLE 4. All but three of the patients had limitation of straight-leg-raising before operation

Findings in those who did not have limitation of straight-leg-raising			
Number	Pre-operative scoliosis	Pre-operative neurological signs	Findings
20	Absent	None	Negative
9	Present	None	Spinal stenosis
36	Present	None	Huge sequestrated L4-5 disc

TABLE 5.

Review of patients who had undergone surgery for presumptive low back and leg pain due to prolapsed intervertebral disc

Reviewed	41
Left district	10*
Information obtained from general practitioners	3
Replied to questionnaire	2
Total	56

* There is a large 'floating' population in this Naval town.

TABLE 6. Residual signs and symptoms

No.	SLR		Reflexes				Motor	Sensory	Backache	Legache	Scoliosis
	R	L	RK	LK	RA	LA					
1	90	85			+	-	Normal	Normal	Terrible at times	None	None
2	70	90			Normal		Weak plantar flexion and dorsiflexion R. foot	Normal	Occasionally very severe	Occasional moderate	None
3	90	90	++	+	+	0	Normal	Normal	Mild	None	None
4	90	90			Normal		Normal	Tingling outer R. foot	'Ordinary.'	Occasional ache outer R. calf	None
5	90	90			Normal		Normal	Normal	Slight occasional	None	None
6	90	90			Normal		Normal	Normal	None	None	None
7	90	90			Normal		Normal	Hyperaesthesia outer L. leg	Slight in bed	None	None
8	90	90			Normal		Normal	Normal	Slight pressure feeling	None	None
9	90	90			Normal		Normal	Normal	Faint ache	None	None
10	85	90	+	+	0	+	Normal	Intermittent stiffness in toes	None	None	None
11	75	90	+	+	0	+	Normal	Loss outer R. foot	Mild	Slight tingling in evening	None
12	90	80	+	+	+	0	Slight weakness dorsiflexion L. foot	Hyperaesthesia outer L. leg	None	Mild intermittent	None
13	90	70	0	0	+	0	Normal	Normal	Bad in winter	Mild ache	None
14	90	90			+	0	Normal	Normal	None	None	None
15	90	90	+	0	+	+	Normal	Normal	None	None	None
16	90	90	+	+	0	+	Normal	Normal	None	'Almost complete relief'	None
17	90	90			Normal		Normal	Normal	Slight on prolonged sitting	None	None
18	85	85			Normal		Normal	Normal	Occasional	None	None
19	75	70			Normal		Normal	Normal	None	Very occasional cramp in calf	Slight
20	90	90	0	+			Normal	Normal	Moderate	Moderate	None
21	90	90			Normal		Normal	Normal	None	None	None
22	90	90			Normal		Normal	Normal	None	None	None
23	85	90			0	+	Normal	Normal	Very mild	None	None
24	90	90			0	+	Normal	Normal	None	None	None
25	90	90			Normal		Normal	Normal	Slight	None	None
26	90	90			+	0	Normal	Normal	None	Very slight occasional	None
27	90	90			Normal		Slight weakness dorsiflexion and plantar flexion L. foot	Normal	None	None	None
28	90	90			Normal		Normal	Normal	None	None	None
29	80	90			0	+	Normal	Paraesthesiae R. foot	None	Cramp at back of R. thigh awakens at night	None
30	90	90			Normal		Normal	Normal	None	None	None
31	90	90			Normal		Normal	Normal	None	None	None
32	90	90			Normal		Normal	Normal	The same	Aches a bit	None
33	90	90			Normal		Normal	Normal	None	Very, very slight	None
34	90	90			Normal		Normal	Normal	The same	The same	None
35	90	90			+	-	Normal	Normal	None	None	None
36	90	90	0	0			Normal	Normal	None	None	None
37	90	90			0	+	Normal	Analgesia outer R. foot	Moderately severe at times	Mild. Severe cramp at times	None
38	90	90			0	-	Normal	Analgesia outer R. foot. Complains of cold feet, R. worse than L.	Occasional, necessitating 2 tabs and 1 hr lying down	None	None
53	90	90			+	-	Normal	Normal	Slight occasional	Slight occasional	None
55	90	90			Normal		Normal	Normal	None	None	None
56	90	80			0	0	Normal	Analgesia outer L. foot	None for 4 years	None for years	None

(No. 25) had a myelogram which showed a large left lumbo-sacral lateral disc prolapse and a small indentation at the L4-5 level. A laminectomy was performed, with removal of a left lumbo-sacral prolapse. Exploration of the L4-5 root did not reveal any disc abnormality. Leg pain persisted and at re-exploration 4 years later a sequestered L4-5 disc was removed, with subsequent freedom from symptoms.

The fifty-six patients had been operated on over a 5-year period, from 1964 to 1968. Forty-one attended for examination and no less than ten had left the district. However, a moderate amount of information was available about these patients, who were last seen 3 years (45), 18 months (51), 8 months (48), 4 months (50), 3 months (47 and 49), 2 months (39 and 40) and 3 weeks (52) after surgery. The general practitioner of one patient (43) wrote 10 months after his operation to say that he had been away from work for 2 months on account of backache.

Two patients replied to a questionnaire. No. 48 wrote to say that he had moderate backache after many hours of strenuous work and a small ache in the leg after many hours of work or driving. No. 54 wrote to say that he was employed driving a Drott and that he still got severe backache and leg ache.

The general practitioners of those who did not attend the review or reply to a questionnaire were contacted. Information was obtained about the remaining three patients. No. 41 still has foot-drop and is under treatment for rheumatoid arthritis with prednisone. The ulcer under her foot has healed and she was seen this month on account of bruising sustained during a fall. Patient no. 46 was reported to be fine from the back point of view and no. 42 saw her doctor frequently about other matters but had no complaints with regard to the low back and leg conditions.

TABLE 7. Summary of residual signs and symptoms in those who attended for review

Reflex abnormality	19
Backache	17
Legache	15
Limitation of straight-leg-raising	11
Loss of sensation or paraesthesiae	9
Loss of power	3
Scoliosis	1

Included in the above category of backache are patients describing their symptoms as 'very mild', 'slight', 'slight occasional', 'mild', 'slight pressure feeling', 'faint ache', 'slight on prolonged sitting', etc.

Some of those with legache had 'very occasional cramp in the calf', 'almost complete relief', 'mild ache', 'mild intermittent', 'slight tingling in the evening', 'occasional ache outer calf', 'very very slight' and so on.

The residual signs and symptoms present in those who attended the review are shown in the table 'Residual signs and symptoms'.

The five negative explorations

Two of these were patients with normal reflexes and limitation of straight-leg-raising. Both had scoliosis and one (27) had paraesthesiae under the sole of the foot and the other (22) weakness of dorsiflexion of the toes, with analgesia over the inner side of the left foot. The first of these had a fenestration and the other a laminectomy, and both made a gratifying recovery; one, a professional footballer, who was able to return to professional football, and another a housewife who was able to return to her normal duties. Both attended for review and had no residual symptoms.

A third patient (9) had normal reflexes, full straight leg raising, gross scoliosis and his myelogram findings showed a complete block at the L3-4 level. No protrusion was found on exploration and it was assumed that his signs and symptoms, which eventually cleared up, resulted from stenosis of the neural canal.

The fourth patient (20) was thought to have a lumbo-sacral prolapse as her Myodil did not pass below that level. She had full straight-leg-raising, no abnormal neurological signs, and persistent backache. Exploration showed no abnormality and she was neither worsened nor improved.

The fifth patient (40) had suffered from backache for a number of years but had no abnormality of tendon reflexes. Straight-leg-raising was about half the normal level in both sides and her posture normal. She had normal power and sensation in the legs. Myelography was inconclusive. This lady had a previous laminectomy in South Africa 8 years before. She was last seen 2 months after operation, when it was noted that she was 'certainly better than before operation', and was advised to seek work.

She had dense adhesions but no disc prolapse. The postal review revealed that she returned to South Africa.

Results

The patients were divided into four groups by a simple classification of results:

Success. Those who were pleased with the results of their operation and had only mild residual signs and symptoms or none at all.

Improved. These had moderate, persistent symptoms, but were better than before surgery.

Recurrence. Success followed by recurrence of symptoms.

Failure. Severe, persistent symptoms.

No patients were made worse, none died, and there were no cerebro-spinal fluid leaks post-

TABLE 8. This table shows whether or not myelography was performed, the surgical approach used, operative findings and the result according to the method of classification described under 'Results'

No.	Myelography	Approach	Findings	Result
1	No	Fenestration	small L. L5-S1 lateral prolapse	Success
2	Yes, but no definite confirmation	Laminectomy	L5 nerve root ganglion excised	Failure
3	No	Laminectomy	Large L. lateral L5-S1 protrusion	Success
4	No	Fenestration	Large R. L5-S1 lateral protrusion	Improved
5	Yes. Complete defect mid lumbar L4-5 level	Laminectomy	Small L5-S1 lateral protrusion R. side	Success
6	Yes. Consistent with a L. lumbo-sacral protrusion	Fenestration	Small protrusion L. L5-S1	Success
7	No	Laminectomy	Large protrusion L5-S1 L. side	Success
8	No	Laminectomy	Small L. L5-S1 protrusion	Success
9	Yes. Shows complete block at third lumbar vertebra	Laminectomy	Negative	Success
10	No	Laminectomy	Large L4-5 R. side	Success
11	No	Fenestration	Large disc R. L5-S1	Success
11	No	Laminectomy	Large L4-5 R. side	Success
12	No	Laminectomy	Large protruded L5-S1 L. side	Success
13	No	Laminectomy	L5-S1 central protrusion	Success
14	No	Laminectomy	Large L5-S1 L. side	Success
15	Yes. Showed an hour glass filling defect	Laminectomy	Sequestered disc free in neural canal (L4-5)	Success
16	Yes. Clear-cut R. 4-5	Fenestration	Large sequestered L. L4-5	Success
17	No	Fenestration	Small protrusion L5-S1 R.	Success
18	No	Laminectomy	R. L5-S1 disc prolapse. Moderate sized R. L4-5. Large prominent sequestered disc	Success
19	No	Laminectomy	L5-S1 large central bulge	Success
20	Yes. Showed 'L5-S1 disc lesion, which is why oil has not dropped into the sacral sac'	Laminectomy	Inflammatory condition of L5 nerve roots. Narrowing of dural sac	Failure
21	No	Fenestration	R. small prolapse L5-S1	Success
22	No	Laminectomy	Negative	Success
23	No	Fenestration	Large R. L5-S1 protrusion	Success
24	No	Fenestration	R. L5-S1 small protrusion adherent to nerve root	Success
25 a.	Yes. Large L5-S1 and small L4-5	Laminectomy	L5-S1 L. prolapse. Nil L4-5	Failure
25 b.	Yes. L4-5	Laminectomy (same approach)	Adhesions. Sequestered L4-5 disc	Success
26	No	Laminectomy	L4-5 adherent. L5-S1 big bulge	Success
27	No	Fenestration	Negative	Success
28	No	Laminectomy	L. lateral L4-5	Success
29	No	Fenestration	Big L4-5 R. side	Success
30	No	Laminectomy	Moderate L. L5-S1	Success
31	Yes. Large protrusion	Laminectomy	Large L4-5	Success
32	Yes	Laminectomy	Moderate L. L4-5 lateral protrusion	Improved
33	Yes	Fenestration	Very small L. 5th lateral prolapse	Success
34	No	Laminectomy (X-ray suggests lamina has re-grown)	R. lateral L5-S1 protrusion removed	Improved
35	No	Laminectomy	2 discs: small R. L5-S1 and large L4-5	Success
36	No	Fenestration	Large sequestered L4-5	Success
37	No	Laminectomy	R. L5-S1 disc prolapse, adherent root	Improved
38	No	Laminectomy	R. lateral lumbo-sacral protrusion	Success
39	No	Fenestration	L4-5	Last seen 2 months after operation
40	No	Laminectomy	Adhesion. No PID	Last seen 2 months after operation
41	No	Laminectomy	L4-5 and L5-S1 discs removed	No follow up
42	No	Fenestration	R. 4-5 sequestered	Success
43	No	Laminectomy	Sequestered R. 4-5	Not known
44	No	Fenestration	L4-5 disc. Tightly adherent root	Not known
45	No	Laminectomy	Central disc prolapse L5-S1	Improved

TABLE 8—continued

No.	Myelography	Approach	Findings	Result
46	No	Fenestration	L. L4-5 PID	Recurrence low back pain 2 years later
47	No	Laminectomy	L5-S1 central prolapse	All right 3 months after operation
48	No	Fenestration	Small R. 4-5 disc	Recurrence 5 months later
49	No	Fenestration	R. L5-S1 convincing small L.	Last seen 3 months after operation
50	Yes	Fenestration	Large L5-S1. Previously had interlaminar PID removal	Fine 4 months later
51	No	Laminectomy	Large R. L5-S1 disc, larger R. L4-5	Weak dorsiflexion R. toes
52	No	Laminectomy	Large L5-S1 protrusion	No record of attendance since discharge from hospital
53	No	Fenestration	Large L. L5-S1	Success
54	No	Fenestration	Large R. L5-S1 disc	Good. Last seen 9 months after
55	No	Laminectomy	Not very convincing L5-S1 bulge	Success
56	No	Laminectomy	Grossly protruded L. L5-S1 disc	Recurrence 4 years later

TABLE 9. Situation of the affected disc in those who attended for review

Level	Number
L5-S1	25
L4-5	10
L4-5 and L5-S1	2
Negative	5
Total	42

TABLE 10. Situation of the affected disc in those who did not attend for review

Level	Number
L5-S1	7
L4-5	6
L4-5 and L5-S1	1
Adhesions only	1
Total	15

TABLE 11. Situation of the affected disc in all patients

Level	Number
L5-S1	32
L4-5	16
L4-5 and L5-S1	3
Negative	6
Total	57

TABLE 12. Approach

Laminectomy	35
Fenestration	27
Total	57

TABLE 13. Sex incidence

Male	31
Female	25
Total	56

TABLE 14. Duration of symptoms before operation

Longest	20 years
Shortest	4 days
Average	3½ years

TABLE 15. Time spent in hospital before operation

Longest	2 months
Shortest	1 day
Average	1½ weeks

TABLE 16. Time spent in hospital after operation

Longest	2 months
Shortest	10 days
Average	2½ weeks

operatively. The dura was inadvertently punctured during twelve operations (nos. 4, 7, 10, 11, 12, 17, 25, 33, 40, 42 and 44) and one patient had a superficial infection (40). Her note on the tenth post-operative day read: 'one stitch hole 0.5 cm yellow necrotic area and 2 towel clip perforations injected'. She was the patient from South Africa whose low back region had been explored before. The findings were 'dense adhesions'. She received cloxacillin by mouth for a fortnight. The infection subsided and the wound healed during that time. This patient had been an in-patient under observation for three weeks prior to laminectomy.

Operative procedure

The infection rate is so low that a description of the details of preparation and surgical technique is given. Many of these patients were admitted to hospital for observation for 2–3 weeks. When surgery had been decided upon they were encouraged to get up and some went home for the few days which elapsed before the operation was performed. Other

patients were admitted the day before a planned operation. The only preparation of the skin was by a warm soap and water bath the day before operation and shaving by an electric razor when the operation field was hairy. The surgeon examined his patient the day before operation and marked the skin by means of a skin marker with a 'R' or 'L' according to which side he intended to explore.

The operation was done with the patient in the lateral position and the surgeon and his assistant sat. The skin of the operation field was washed with soap and water by the surgeon's hands when the patient had been positioned, and dried by means of a large sterile swab or sterilized paper towels. The nurse then applied spirit biniodine 1 in 500; more latterly betadine. The area was then draped with sterile towels and painted with Mastisol. A square of stockinette was then stuck on. At one time 'Steridrapes' were used for a few months but it was found that applying these resulted in accidental breaking of the sterile technique and their use was abandoned.

The 'no touch' surgical technique was carefully followed by the surgeon, his assistant and the instrument nurse. Bleeding points outside the neural canal were coagulated by diathermy. Chromic catgut was used for repair of the lumbar fascia. No unabsorbable sutures were used except in the skin. At the conclusion of the operation a 'Redivac' suction drain was inserted through a separate puncture wound. Sulphathiazole-penicillin powder was insufflated into the wound before skin closure. The wound was closed by means of single strand nylon vertical mattress sutures and a dry dressing was applied, held in position by Elastoplast. The patient received an intramuscular injection of 1.5 ml Triptolpen on the day of operation.

TABLE 17.
Time off work after surgery

Longest	4 months
Shortest	2 weeks
Average	6½ weeks

TABLE 18.
Results in those who attended for review

Success	34
Improved	2
Recurrence	2
Failure	4
Total	42
(42 operations on 41 patients)	

TABLE 19. Summary of results in those who did not attend

No.	Last seen	Result	Locality
39	2/12	Advised return to work. Success	Left district
40	2/12	Improved	Gone abroad
41	27/12	Improved. Still weakness dorsiflexion L. foot and analgesia	Doctor telephoned
42	13/12	Success. Discharged	Doctor telephoned
43	1/12	Pleased. 'Pretty free from pain'	Left district
43	10/12	Later I heard by letter that he had been off work for 2 months with backache	
44	2/12	Having convalescence. Success	Left district
45	39/12	Persistent backache. Central prolapse L5-S1	Left district
46	24/12	Success. Recurrence of backache subsided with rest	Doctor telephoned
47	3/12	Success. Had membranous glomerulonephritis	Left district
48	8/12	Moderate. Readmitted with recurrence on 19/10/67	Replied to questionnaire
49	3/12	Success. Advised to return to work as a plumber.	Left district
50	4/12	Success. Had previous prolapsed intervertebral disc removed in USA 10 years ago	Left district
51	18/12	Success	Gone abroad
52	3/52	Success	Left district
54	9/12	Complained of severe back and legache but did not attend for review	Replied to questionnaire

TABLE 20.
Results in those who did not attend
in so far as is known

Success	8
Improved	3
Recurrence	3
Failure	1
Total	15

TABLE 21.
Results in all 57 operations

Success	42
Improved	5
Recurrence	5
Failure	5
Total	57

TABLE 22.
Results in 35 laminectomies

Success	24
Improved	5
Recurrence	3
Failure	3
Total	35

No patient developed signs of deep vein thrombosis or pulmonary embolism. The measures taken to avoid these complications were:

TABLE 23.
Results in 22 fenestrations

Success	18
Improved	0
Recurrence	2
Failure	2
Total	22

1. Elevation of the foot of the bed for at least 24 hr.

2. All nurses were instructed to request the patients to plantar flex the feet against the resistance of the nurse's hand whenever they gave nursing attention to the patient.

3. A physiotherapist encouraged movement daily, starting on the first post-operative day.

Patients usually sat out of bed for half an hour on the sixth post-operative day and then began to walk. The average period spent in hospital before surgery was $1\frac{1}{2}$ weeks and the average period after surgery up to the time of discharge from in-patient treatment was $2\frac{1}{2}$ weeks.

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