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**Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota**



**Herniation of
Intervertebral Disc**

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

Vol. XIV

Friday, March 5, 1943

Number 18

INDEX

	<u>PAGE</u>
I. LAST WEEK	210
II. MEETINGS	
1. ANATOMY SEMINAR	210
2. WILLIAM ROOT LECTURE	210
III. LETTER	210
IV. POSTERIOR HERNIATION OF THE INTERVERTEBRAL DISC . . .	
. . . W. T. Peyton, Jules D. Levin, and Horace Scott. .	211 - 222
V. GOSSIP	223

Published for the General Staff Meeting each week
during the school year, October to June, inclusive.

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William A. O'Brien, M.D.

I. LAST WEEK

Date: February 26, 1943

Place: Recreation Room,
Powell Hall

Time: 12:15 to 1:00 P.M.

Program: "Erythema Induratum"
W. G. Fredericks

Discussion

H. E. Michelson
Frank Hirschboeck

Attendance: 98

Gertrude Gunn,
Record Librarian

- - -

II. MEETINGS1. ANATOMY SEMINAR

Saturday, March 6 at
11:30 a.m., in room 226, Institute of
Anatomy.

"Lymphocytogenesis in Human Lymph Nodes"

Dorothy S. Reiff

"Chloroma and Multiple Myeloma"

Robert H. Reiff

- - -

2. WILLIAM ROOT LECTURE

Tuesday, March 9 in
the Fine Arts Reception Room, Coffman
Memorial Union. Time is 8:30 p.m.

"The Marriage of Medicine and Government"

Dr. Haven Emerson

III. LETTER

Dear Miss Gunn:

Please send me the Staff Bulletin
for the coming year. Unfortunately, I
have been typed as an organizer and
this is the third time I have been sent
to a new camp to open and organize the
Surgical Service. It really is a lot of
fun, though, and when everything gets
to running smoothly, I'm ready to move
one step farther.

I recently was promoted to the rank
of Lieutenant Colonel and that probably
will mean that I get an administrative
rather than a professional job, but I
enjoy whatever comes.

Please remember me to all my old
friends at Minnesota, if any still are
left.

Sincerely,

Warner F. Bowers
Lt. Col. M.C.,
Chief of Surgical
Service

- - -

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IV. POSTERIOR HERNIATION OF THE INTERVERTEBRAL DISC

W. T. Peyton
Jules D. Levin
Horace Scott

(Analysis of sixty-five cases)

Many comprehensive papers and several symposia have been published in current literature on the so-called syndrome of the herniated disc. Surprisingly little, however, is to be found in any of these papers regarding the ultimate post-operative change in physical findings. This paper is essentially a follow-up analysis of 65 cases of herniated disc, with special reference to recovery analyzed as to change in the individual symptoms and signs. The material included in this study represents all of the cases of herniated disc seen and treated at the University Hospitals by the division of Neurosurgery up to August 1, 1942. The first laminectomy for herniated disc was performed here in 1938. Hence the maximal period of follow-up is approximately $4\frac{1}{2}$ years, and the minimal period of observation is 6 months. The series includes 65 cases upon whom laminectomy was performed after the diagnosis of posterior herniation of the intervertebral disc was made.

History

Kocher (1896) reported the first account of traumatic rupture of an intervertebral disc. It was found at autopsy on a man who fell 100 feet and landed on his feet. Middleton and Teacher (1911) reported after autopsy another case of traumatic rupture of intervertebral disc which had produced a paraplegia. Goldthwaite (1911) was the first to make a diagnosis of traumatic rupture of the intervertebral disc. In a man who developed paraplegia following hyperextension for relief of so-called sacroiliac disease, Goldthwaite assumed that the cauda equina was compressed by the fragments of the ruptured disc, but when this patient was explored by Cushing only narrowing of the canal at the lumbosacral level was demonstrated. However, the

history presented is so typical that with our present knowledge it appears quite probable that a herniated disc was overlooked.

During the following two decades many pathologists and neurosurgeons reported ventral extradural tumors adjacent to the intervertebral discs but mistook them for neoplasms and variously termed them "chondromata, fibromata, ecchondroses, enchondromata, and fibro-chondromata." These masses represented what we now recognize as herniated disc. Eventually Dandy (1929) reported two cases of ruptured intervertebral disc which he recognized as such, but before operation he had diagnosed these lesions as tumors of the cord or cauda equina. Dandy did appreciate the mechanism of pathology of posterior herniations of the intervertebral disc and its role in the compression of rootlets, but at this time he still visualized such ruptured discs as resulting typically in partial or complete paralysis, alteration or loss of bowel and bladder function, and decrease or loss of the sensory modalities. The following year (1929) Alajouanine and Petit-Dutailly reported two cases of backache and sciatic syndrome as caused by traumatic rupture of the intervertebral disc, recognizing most all of the important clinical findings as we know them, and noting relief from symptoms with surgical removal of the herniated discs. In 1934 Mixter and Barr established these disc lesions as the etiology of backache with associated sciatic syndrome when they emphasized and popularized the concept that root compression occurred in posterior herniations of the intervertebral disc. Up to this time the diagnosis of ruptured intervertebral disc was made only at operation but they demonstrated that it could be recognized preoperatively in cases of low back and sciatic pain even when there were slight changes on neurological examination.

Terminology

The most nearly accurate description of this clinico-pathological entity according to the manner of its production is "rupture of the annulus fibrosus with

postero-lateral or posterior herniation of the nucleus pulposus." The more popular terms employed however, include "herniated disc, protruded disc, ruptured intervertebral disc, and posterior herniation of the intervertebral disc."

Anatomy

The intervertebral disc consists of a central, more fluid nucleus pulposus, and a dense and tough peripheral annulus fibrosus. The latter binds the adjacent vertebral bodies firmly, attaching both to the bony epiphyseal ring and to the cartilage plates. The hyaline cartilage plates are adherent to the intervertebral surfaces of the vertebral bodies above and below. The nucleus pulposus is contained in a fibrocartilage envelope which merges with the annulus fibrosus to enclose the nucleus. This envelope also separates the nucleus from the cartilage plates above and below. The nuclear pulp is not free but is traversed by interlacing fine fibres extending from the fibrocartilage envelope. The fibres are interspersed with cartilage cells, rarely notochord cells. The consistence of the nucleus pulposus is moderately tough but very plastic, most nearly resembling moist fascia.

The nucleus pulposus arises from the primitive notochord, while the annulus fibrosus and the fibrocartilage envelope arise from the adjacent sclerotomes.

The fluid nucleus pulposus serves to distribute the forces transmitted to the spine evenly over the intervertebral surfaces. In the normal disc the annulus is subjected only to forces tending to stretch, but if the nucleus herniates or is in any other way modified, either in position or fluidity, the annulus becomes subjected to compression forces it is not designed to withstand.

Because of the constant stress and strain brought to bear on the intervertebral discs, any incipient pathology becomes exaggerated without the occurrence of a single severe trauma.

Age and Sex Distribution

There appears to be a definite age incidence in herniated disc. Lesions in the first decade have never been reported. They occur occasionally in the second decade, are most frequent in the third, fourth, fifth and sixth decades, with a maximum of 35% in the fourth decade, but they are found even in the seventh and eighth decades. Probably on account of occupation and exposure 70% to 75% of these lesions occur in the male. The correlation of age and sex incidence in the 65 cases reviewed is shown below:

Age variation: 17 to 64 years

	<u>Cases</u>	<u>Per Cent</u>
Males:	47	72.4
Females:	18	27.6
Totals:	65	100.0

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Age and Sex Distribution

Totals (Male and Female)				Male		Female	
		Cases	Per Cent	Cases	Per Cent	Cases	Per Cent
Below 20 years		3	4.6	2	3.1	1	1.5
20 - 30 "		12	18.4	10	15.3	2	3.1
30 - 40 "		21	32.1	15	23.	6	9.2
40 - 50 "		23	35.2	16	24.5	7	10.7
50 - 60 "		4	6.1	4	6.1	0	0
Above 60 years		2	3.1	0	0	2	3.1

Andrae (1929) found that in 15% of routine autopsies there was evidence of herniated disc, many of which were too small to be of clinical significance. Apparently no effort was made at this time to correlate the autopsy findings with the clinical history. Surgical experience, however, indicates that this lesion is the commonest single cause of low backache with sciatic syndrome. Many backaches heretofore ascribed to vague causes as lumbo-sacral and sacro-iliac strain undoubtedly represent cases of herniated disc. Many observers no longer recognize sacro-iliac strain as a clinical entity.

Symptomatology

The initial symptom in herniated disc is low backache, which occurs in 70% of all cases; however the most typical symptom is pain in the distribution of the sciatic nerve of the involved side, i.e., in the gluteals, hamstrings, and leg muscles. This sciatic syndrome rarely appears simultaneously with backache, but more often occurs some time after the onset of backache, and frequently only after repeated insults to the back. Bradford and Spurling report bilateral sciatic pain in 15% of cases but we have found it only in 6.1% (4 cases, two of which were midline discs).

Trauma to the spine, such as lifting, slipping, sudden twisting, or forcibly falling on the buttocks usually initiates the onset of backache. The incidence of trauma as an etiological factor in herniated discs is given in various series,

is shown below:

	Cases	Per Cent
Barr (1938)	58	77
Fincher (1939)	50	70
Bradford & Spurling (1939)	35	50
University Hospitals (1942)	65	67

The pain is usually aggravated by anything which suddenly changes or increases the intra-spinal pressure, as coughing, sneezing, laughing, defecation, also by any activity that stretches the sciatic nerve, as flexion of the spine. Remissions and exacerbations are typical, occurring in 40 to 50% of cases, and pain usually occurs in episodes of ever increasing severity until eventually the patient is totally incapacitated. Subjective sensory changes or paresthesias may be present and take the form of numbness, tingling, burning, stinging, prickling, formication, creeping or crawling sensations. Their distribution is probably of more value in localization than is that of pain. Postural changes, when they occur, are those of classic sciatica. Weakness, paralysis, loss of bowel and bladder function, and atrophy are present only with large protrusions which compress the cauda. Neuroses may modify, complicate, and even simulate many of the above symptoms.

Physical Findings

The clinical findings are striking in many instances, and are not usually in-

cluded in a general routine physical examination. The more important signs, and the various tests to elicit them are discussed below:

The posture is frequently characteristic; there is usually some degree of obliteration of the normal lumbar lordosis, varying from mild straightening of the lumbar spine to actual reversal of the lumbar curve with kyphosis and a fixed, rigid spine. Motion is markedly limited, especially flexion and extension in the lower spine. Some show, in addition, scoliosis and listing away from the side of pathology. The customary habitus and that of greatest comfort, is one of slight flexion of the trunk with thigh and leg also slightly flexed, and the foot in plantar flexion. Free and easy motion is always inhibited, and movement is most deliberate and slow and cautious.

Muscle spasm of the erector spinae group in the lumbar spine is always a prominent feature, and frequently the inequality of the spasm on the two sides can be visible by the difference in prominence of the paravertebral muscle groups. Palpation readily confirms the presence or absence of spasm and the comparative degree on the two sides.

Space tenderness or tenderness to deep pressure in the interspace overlying the lesion, lateral to the spinous process, frequently aids materially in localizing the lesion. Frequently with deep palpation, point tenderness may be determined at the site of lesion, and if such a maneuver results in sciatic radiation of pain, the localization of the lesion is confirmed.

Sciatic tenderness to palpation, somewhere along its course, is generally present. The most frequent sites of tenderness are sacro-iliac areas, gluteal region, upper posterior thigh and the vicinity of the hamstring tendons.

Maneuvers which stretch the sciatic nerve intensify the pain and manifestations of root irritation. The sciatic nerve stretching tests used here at the University Hospitals are listed below:

Straight leg raising test: with the patient in the recumbent position the extended extremity is raised; the excursion of the extremity from the horizontal position until the position in which the patient first complains of backache, sciatic pain or painful tightness of the hamstrings is recorded in degrees. The leg must remain completely extended at all times for an accurate recording of this test. The limitation in straight leg raising is recorded in degrees on both sides. Inequalities on the two sides are of greater significance than a single reading for one extremity; values vary with age and degenerative processes.

Lasegue test: the maneuver of the Lasegue and Kernig tests are identical; when one has evidence of meningeal irritation and infection and performs the test, it is termed a Kernig test; if one examines a patient with low back pain and sciatic syndrome the maneuver is termed the Lasegue test. With the patient in the recumbent position the leg is flexed on the thigh and the thigh on the abdomen. The leg is then extended, keeping the thigh flexed; the presence of pain in the back or hamstrings in any position less than 120 degrees constitutes a positive test.

Naffziger test: is a modification and confirmation of the straight leg raising test; with the patient in the recumbent position, the foot is forcibly dorsi-flexed on the leg; as the extended extremity is raised, this further stretches the sciatic nerve and causes pain in the back or hamstrings; it is usually positive at an angle 5 - 10 degrees less than a straight leg raising test.

Duncan's alternate push and pull test: upward pressure on the painful leg with traction on the painless leg will increase the pain, and the reversal of the procedure, i.e., traction of the painful leg and upward pressure on the painless leg, will relieve the pain. This test is based on the fact that definite lateral flexion of the spine thus produced will effectively compress a lesion, especially

if it be laterally placed.

Duncan's hyperextension of the spine: with the patient in the supine position, the legs are allowed to hang over the end of the examining table, thus tending to produce a definite increase in the lumbar lordosis. In a typically positive test there is first a latent period of 1 - 2 minutes during which time the patient is free from pain; this is followed by a steadily rising tide of peripheral pain; flexion of both extremities on the trunk usually affords complete relief of pain.

Patrick test: also known as the knee rocking test: with the patient supine, the thigh and knee are flexed and the external malleolus is placed above the patella of the opposite leg; this should be done readily in the normal individual. Upon depressing the knee pain is promptly elicited and the test is positive if the case is one of arthritis of the hip joint or related hip pathology.

Bonnet test: with the patient in the supine position, the thigh and knee are flexed acutely on the abdomen, and the thigh is then adducted, thus putting the sacro-iliac joint on the stretch. Pain in the sacro-iliac region was formerly thought to be indicative of so-called sacro-iliac disease; however, the test is positive in many cases of herniated disc.

Jugular compression test of Viets: with the patient erect, a blood pressure cuff is placed about the neck and the cuff inflated and maintained at 40 mm Hg. for 2 minutes. The venous return is thus impeded and the resulting increased intra-spinal pressure exaggerates the patient's radicular pain. Variation in pressure rather than maintained pressure causes pain and hence the patient may also get pain with sudden release of the cuff pressure. This test is rarely positive except in those cases in which pain is also exaggerated with coughing and sneezing. A positive test is pathognomonic of intra-spinal disease, altho a complete block in the subarachnoid space is not necessary for a positive test.

The most common abnormality on neurological examination in patients suffering with herniated disc is diminution or absence of the achilles reflex on the affected side. This phenomenon has been reported to occur in as many as 80% of herniated discs. Diminution in the knee reflex occurs much less frequently. The presence of the former tends to localize the lesion at the lumbosacral space, or the lumbar 4-5 space, while the latter suggests a lesion at the lumbar 3-4 space. Reflex changes occurring in our series of cases are shown below:

	Per
Cases	Cent
Changes in ankle jerk	42
Changes in knee jerk	13
Changes in both K.J. and A.J.	9
Changes in K.J. only	4

Objective sensory changes occur as hypesthesia and hypalgesias. Paresthesias more often occur without any evidence of objective sensory changes. When one rootlet is involved, subjective sensory changes may or may not be present. But when two rootlets are involved, as is so frequent in the lumbosacral disc herniations, the objective sensory findings usually accompany paresthesias. The most frequent site of sensory changes is the lateral aspect of the leg and foot, following the distribution of the 4th and 5th lumbar and 1st sacral segments. A comparison of the incidence of sensory changes objectively is shown below:

	Per
	Cent
Spurling and Bradford	75
Love and Walsh	31
Fincher	85
University Hospitals series	40

Atrophy and muscle weakness and even complete paralysis of the extremities may result occasionally, especially if the herniations are large or midline.

Herniated discs can occur at any level

in the vertebral column, but 90 to 95% of such lesions occur at either the lumbar 4-5 space or the lumbosacral space.

The chart below shows the distribution of lesions at the various levels in our cases:

	<u>Case</u>	<u>Per Cent</u>
Th. 11 - 12 space	2	3.6
Th. 12 - L 1 "	1*	1.8
L 1 - 2 space	0	0
L 2 - 3 "	1*	1.8
L 3 - 4 "	3	5.4
L 4 - 5 "	26	47.4
L 5 - S 1 "	24	43.6

*These two were part of multiple discs, and were associated with another disc lesion at another level.

The relative incidence of the discs at the lumbar 4-5 space and the lumbosacral space is demonstrated and compared in the various series:

	<u>4th space</u>	<u>5th space</u>
Barr (1937)	68	32
Mixter	67	33
Love and Walsh	45	55
Bradford and Spurling	33	67
University Hospital series	52	48

Multiple disc lesions can occur but are rather unusual; their incidence is listed:

	<u>Cases</u>	<u>Per Cent</u>
Love and Walsh University Hospitals		12. 3.5

Of the verified discs (55 cases) at the University Hospitals, the incidence according to side of lesion is:

	<u>Cases</u>	<u>Per Cent</u>
Right side	27	50
Left side	26	47
Midline	2	3

Lumbar puncture is usually performed above the level of the lesion, and for this reason as well as the small size of the lesion there is usually no disturbance in the hydrodynamics of the cerebro-spinal fluid. Elevation of protein, when it occurs, depends on site of tap, i.e., how far from the lesion; the closer the tap is made to the lesion, the higher the protein value. Some observers have even suggested that lumbo-sacral taps be made to obtain fluid at or below the level of the lesion. For the above reasons many cerebro-spinal fluid protein values are normal. Protein elevation is the only abnormality demonstrable in the cerebro-spinal fluid. Elevated protein values have been reported in as high as 80 per cent of cases, but in our series have occurred in only 42 per cent of cases (taking 40 milligrams per cent as the upper limit of normal).

Roentgenologic Diagnosis

Roentgenograms of the lumbo-sacral region are of greatest value in the differential diagnosis to rule out bony lesions as possible causes for similar syndromes, since the protruded disc itself is not visualized in the ordinary films. However, there may be a narrow disc at the level of the herniated disc; it is a rather infrequent finding, occurring only in 12 of 55 cases of verified disc lesions (21.8%) in our series, and is not conclusive evidence of the presence of herniated disc even when such narrowing is present.

Some type of contrast myelography is very desirable; air is rather unsatisfactory but radio-opaque lipiodol is excellent. The examination is done under the fluoroscope; 4 cc. of lipiodol is injected, the examination done, and the lipiodol removed by aspiration under the screen; with the development of this technique all or almost all of the oil can satisfactorily be removed; hence all previous objections to lipiodol myelography on the basis of its remaining in the subarachnoid space permanently are obviated. Other contrast media which are less viscous and which may prove more satisfactory in

demonstrating far lateral discs now are being investigated. Pantopaque, one such substance, is eventually absorbed if not all removed at time of examination. However, lipiodol examination should never take the place of a careful and detailed neurological examination. Oil examinations sometimes demonstrate defects that are due to anatomical peculiarities rather than true disc lesions, and occasionally fail to demonstrate lesions which are demonstrated at surgery. The correct diagnosis can be made clinically in 80 to 90% of the patients; and in addition 50% of the cases accurate localization can be made by clinical findings.

The following chart shows an analysis of findings at myelography correlated with the surgical findings in the cases reviewed:

Myelography: Oil and Air

	<u>No. of Cases</u>				<u>Myel-</u>
	<u>Pos.</u>	<u>Neg.</u>	<u>Pos.</u>	<u>Neg.</u>	<u>graphy</u>
	<u>Oil</u>	<u>Oil</u>	<u>Air</u>	<u>Air</u>	<u>not done</u>
Disc lesion found	21	0	29	3	5
No disc lesion found	5	2	3	2	1
Totals	26	2	32	5	6
Total positive operations:			55	cases	
Repeated operations:			3	"	
Total negative operations:			10	"	
Repeated operations:			3	"	
Total myelograms performed:			59	"	
Repeated myelograms:			6	"	
No myelograms done :			6		

Differential Diagnosis

Some of the diseases which may give similar symptoms and the syndrome of the herniated disc, that we have encountered in our clinic are: primary and metastatic lesions of the spine, tumors of the cauda equina, spondylolisthesis, tuberculosis of the spine, brucellosis of the spine, herpes zoster, blood dyscrasias, lues.

Treatment:

During the initial episode of pain or in the presence of acute and severe exacerbation of the pain, Buck's extension on the affected side may constitute very satisfactory conservative therapy, with gratifying results for temporary relief. It has been our procedure to carry out such conservative therapy in the first acute attack of low back and sciatic nerve pain. Surgical removal, of course, is the only treatment for permanent relief.

The type of surgical approach has varied with the accumulating experience of the surgeons. During the earlier years a bilateral laminectomy (total) was performed, whereas during the recent years, the tendency has been to do a hemi-laminectomy, and more recently to do a partial hemi-laminectomy, removing only the lower border of the lamina of one side. The procedure chosen of course depends on the location and size of the lesion. In large lesions or in midline lesions, bilateral total laminectomy is still undertaken to prevent injury to the rootlets in the cauda for there is no room to retract the dura and rootlets without undue compression. Injury to rootlets in attempting to remove a large disc thru too small an exposure can occur easily. Lamina should be sacrificed rather than to risk trauma to the rootlets.

The following charts show the surgical trends at the University Hospitals both in total cases and in cases by years:

	<u>Cases</u>	<u>Per Cent</u>
Hemi-laminectomy	44	67.3
Total laminectomy	21	32.7

Year	Total Cases		Total laminectomy		Hemilaminectomy	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
1938	3	4.6	3	4.6	0	0
1939	7	10.7	6	9.2	1	1.5
1940	14	21.4	6	13.3	5	7.6
1941	24	36.7	3	4.6	21	32.3
1942*	17	26.0	1	1.5	16	24.5

*Represents cases up to August 1st of year only.

Recurrences of herniated discs have been reported both at the same location and at another space. Failure to remove all the loose fragments of the herniated

nucleus pulposus may account for the former, and inherent weakness or predisposition may account for herniation at another disc. Incidence of recurrence is shown below:

Love (1938)	1 recurrence in 150 cases	0.7%
Bradford and Spurling (1941)	4 recurrences in 160 cases	2.5%
University Hospitals (1942)*	1 recurrence in 55 cases	1.8%

*2 additional cases were re-explored because of recurrent symptoms and findings suggesting recurrent discs but no definite lesion found.

Results

In the series of cases here reported, laminectomy has been done on all 65 cases after the diagnosis of herniated disc was made. The results of surgery appear in the following charts:

	Cases	Per Cent
Discs found at surgery	55	84.2
No disc found at surgery	10	15.8
Total number of cases operated upon	65	100.0

Results of Surgery of University Hospitals Series

	Cases	Per Cent
Relieved	43	65.9
Improved	10	15.7
Not Improved	9	13.8
No follow-up	3	4.6

Comparison of Surgical Results of Various Series

	<u>Cases</u>	<u>Relieved</u> <u>Per Cent</u>	<u>Improved</u> <u>Per Cent</u>	<u>Poor</u> <u>Per Cent</u>	<u>Deaths</u> <u>Per Cent</u>
Love and Camp (1937)	50	66	30	4	
Barr (1938)	58	83		5	2
Fincher (1939)	50	80	10	10	
Bradford and Spurling (1939)	35	74		26	
Hawk (1936)	10	30		50	20
University Hospitals (1942)	65	66	16	13.8	4.2 (no fol- low up)

Results of Surgery as Regards the Surgical Findings at University Hospitals

	<u>Positive Cases</u>		<u>Negative Cases</u>	
	<u>Number</u>	<u>Per Cent</u>	<u>Number</u>	<u>Per Cent</u>
Relieved	37	56.9	6	9.2
Improved	8	12.3	2	3.2
Not relieved	6	9.2	3	4.6
No follow-up		3 cases	4.6%	

Tabulated comparison of the pre-operative symptoms and findings of the University Hospitals series as compared with the post-operative symptoms and findings appear in the following charts:

	<u>Symptoms</u>			
	<u>Pre-op.</u>		<u>Post-op.</u>	
	<u>Cases</u>	<u>Per Cent</u>	<u>Cases</u>	<u>Per Cent</u>
History of trauma	44	67.3	-	-
Backache	65	100.	29	44.4
Sciatic syndrome	63	96.4	18	27.5
Cough and Sneeze	58	88.7	15	23.0
Paresthesias	27	41.3	24	36.7
Total number of cases	65			

Clinical Findings

<u>Pre-op.</u>			<u>Post-op.</u>	
	<u>Cases</u>	<u>Per Cent</u>	<u>Cases</u>	<u>Per Cent</u>
Obliteration of Lumbar curve	63	96.4	41	62.7
Muscle spasm	65	100.0	19	29.1
Space tenderness	64	98.0	18	27.5
Sciatic tenderness	62	95.0	7	10.7
Scoliosis	11	16.8	1	1.5
Straight leg raising	65	100.0	13	19.9
Reflex changes	46	70.4	36	55.1
Sensory findings	26	39.8	22	33.7
Atrophy	9	13.8	9	13.8
Neurosis	8	12.3	8	12.3

Analysis

In judging our results we used the following criteria to indicate grades of improvement: The case was considered relieved if the patient had complete relief from pain both in back and leg and could resume his former activities. Case was considered improved if he had less pain and discomfort than before operation, and if his sciatic syndrome was alleviated; he could do light work but had some discomfort. Case was classified as a poor result if there was no improvement over the pre-operative status.

Backache, which occurred in 100% of cases pre-operatively has been completely obviated in about 70% of cases and relieved to a great extent in about 20% more of cases. (Note: the 44.4% of backaches given as persisting after operation includes all cases having even the slightest amount of backache at any time, or about 15% of these are in cases who have some dull aching in the back only after extreme exertion or unusually heavy day's labor.)

The sciatic syndrome or evidence of root irritation has been reduced from 96% pre-operatively to 27.5% post-operatively. Similarly, occurrence and aggravation of pain with coughing and sneezing, another evidence of rootlet irritation, has been reduced from 88.7% to 23%.

Paresthesias, on the other hand, show little change from the pre-operative status, being reduced only 5% from 41% to 36.7%.

In the clinical findings, lumbar curve has been restored in 36% of cases, the normal lumbar curve still being obliterated in 63% of cases post-operatively. Muscle spasm is reduced from 100% to 29%; this compares closely with the relief of root irritation as indicated above.

Space tenderness is similarly reduced in approximately the same frequency as root irritation. Sciatic tenderness was relieved in 85% of cases, 10% still retaining evidence of nerve tenderness; these were obviously in the "no improvement" group.

Scoliosis or list almost always disappeared completely, being reduced from 16.8% to 1.5%. Limitation in straight leg raising was removed in 80% of cases. Incidence of reflex changes have been reduced from 70% to 55%. There has been some partial or complete return of ankle jerk in 18.4% of cases. On the other hand, in 26% of cases there has been partial or complete loss of the ankle reflex post-operatively, as compared to the preoperative status. This is apparently due to manipulation of rootlets in removal of discs with some damage to the rootlet. Pre-operative sensory changes are altered but little by the surgical

procedure, and are reduced only from 39.8% to 33.7%, showing that damage due to compression of the rootlets is in many instances irreversible. Atrophy is unaltered by surgery, and neurosis has remained after surgery in all cases in which it was diagnosed before operation.

Conclusions

Review and analysis of 65 cases of herniated disc is presented. Analysis of post-operative follow-up data reveals that complete relief is obtained in 65.9% of cases with improvement occurring in 15.7% of additional cases. (These figures include all of our cases - some of our earlier cases were probably missed.) Our more recent cases show even greater percentages of complete relief. These compare favorably with reports of other clinics thruout the country.

The backache and sciatic syndrome, which are the presenting and disabling complaints, are relieved in 2/3 of the cases, and are much improved in $\frac{1}{2}$ of the remaining group.

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V. GOSSIP

At the meeting of the County Medical Society Officers in Hotel Lowry in St. Paul on last Saturday a special Continuation Course on "Diseases of Childhood" was announced. It will be given March 29, 30, and 31, 1943 under the joint sponsorship of the University of Minnesota, Minnesota Department of Health and Minnesota State Medical Association. Fifty all-expense scholarships will be made available by the Division of Child Hygiene with Social Security funds. Physicians living outside the Twin Cities and Rochester will be eligible to attend. A possibility of other courses of similar type was also discussed. After a certain number of physicians from the rural districts go into military service it will not be possible to send any more. Selections must be made from the more populous states which have not yet met their quotas. As the war will undoubtedly last quite some time a special plan of continuation medical education for practicing physicians must be evolved. It will become more and more difficult for teachers to go to county medical societies for instructional purposes. A possible plan is to bring in certain physicians for special instruction. These men in turn would carry back information from us to their own groups. In order to finance the program one of the Foundations and the Minnesota State Medical Associations would be asked to supply funds. The physician himself would be expected to defray a portion of the expense as he would receive more from the plan than anyone else. There would be no attempt to teach these men new skills. The subject material would consist primarily of modern methods of diagnosis and treatment, with emphasis on the proper type of treatment in each condition, rather than a demonstration of one type of treatment. Details have not been elaborated. It would appear this plan, a modification of the Bingham Associates plan in Maine, would be successful if the proper men were selected. Well-trained men in the rural districts would welcome an opportunity to establish a connection with a teaching center. The type of rural medicine in Minnesota and surrounding states is already above average, and this plan would make it even more effective....On the way to Fergus Falls with Dr. Willard Burnap to spend

the next day in his city, Fergus Falls. The snow is flying in all directions. It is soon dark but the roads are in excellent condition. We arrive at midnight and nothing is quite so welcome as a warm hotel room after a long cold ride. In the morning the phone rings early to tell me the school will take me on at 8:45. A hasty breakfast and a short ride to the high school brings me face to face with many hundreds of boys and girls in junior and senior high school. It is a regulation 50 minute period, which seems long to me. The pupils give plenty of signs of life as they squirm and wriggle and alternately grow very quiet and still. They differ from university students in that one can at least tell if they are alive. I gave them the simple rules of hygiene with special emphasis on the subject of keeping clean. Boys and girls with clean skins, clean teeth, clean bodies, clean hands, clean feet, and clean clothes will win all the prizes. Haynes Fowler, chief of the Surgical Staff of General Hospital No. 26 gives the best lecture on how to achieve clean feet. His own feet are the largest on our staff (size 13+). He insists that most foot troubles including objectionable odors could be eliminated if youngsters understood the relationship between skin care, dry socks and dry shoes. After assembly I visited the rooms and later saw the primary schools. Three of these are new buildings and they are architectural gems. They are one story buildings with large playgrounds. Located in the exact center of the district in which the children live. One large room serves as playroom or meeting place. The libraries leave nothing to be desired. Coats and wraps are kept in special closets with a master control on all of the doors. Wall boards provide space for posting material. Each school is designed for 240 pupils and should they no longer be necessary for school purposes, they may easily be changed over. At noon at Kiwanis Club and it seems as if few young men are left. After telling of contributions of American Medicine, I go to my room for a nap. At dinner to speak to medical men, their wives, the dentists and their wives, and the nurses. Then to a meeting of the Parent and Teachers Assns. In early morning to train, hours late...