

CERVICAL DISK RUPTURE

Diagnosis and Therapy

By

CARL HIRSCH

The term brachialgia is generally used as a collective name to describe the symptoms in painful conditions of the shoulder and arm. Many attempts have been made to form an etiologic classification and to differentiate various pathologico-anatomical or pathophysiological processes underlying such conditions. Broadly speaking, three different groups of morbid conditions have in recent years become more or less clearly distinguished; all despite their different pathogenesis apparently can produce a similar syndrome, combining referred pain, vasomotor and circulatory disturbances, and local changes in certain parts of the arm, mainly the shoulder joint. (Duplay 1872, Déjerine 1891, 1916, Barré 1926, Codman 1934, Haggart and Allen 1935, Spurling and Scoville 1944, Spurling 1947, De Palma 1950, Frykholm 1951, Lindemann and Kuhlendahl 1953, Hult 1954, Jackson 1958, Broager 1959-60).

Many painful conditions in the arm more or less affect circulation, producing such symptoms as a decreased resistance to strain expressed by easy fatiguability, and an increased sensitivity to changes in temperature. Improvement of the local circulation, achieved by cervical sympathetic blocks, is therefore effective in reducing and sometimes completely allaying the symptoms. Scalenotomy, periarterial sympathectomy of the subclavian artery, cervical sympathicotomy, or resection of the stellate ganglion likewise alleviate the symptoms, although sometimes their effect is only temporary. These methods have therefore at regular intervals recurred in the therapeutic arsenal (Reischauer 1955, Lidström 1959).

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A characteristic feature of brachialgia is that the distribution of the pain over the arm varies. Most severely and most frequently it involves the shoulder region and impaired mobility at the shoulder joint is often a concomitant finding. It has been held that such decreased mobility may be the combined result of local changes in or around the joint and diminished activity as a result of the pains, implying that such inactivity may cause shrinking of the capsule which in its turn results in a loss of mobility. Decreased mobility has therefore not been considered as a decisive factor in the classification of cases according to their etiologic background. Instead, radiation of the pain down to the hand and fingers has been considered to indicate cervical nerve root lesions, whereas pain localized to the shoulder joint alone has been regarded as indicative of joint involvement; periarthrititis, bursitis, tendinitis, and rupture of the aponeurosis are some of the pathologico-anatomical terms denoting such involvement. Neurologic disturbances reflected by sensory and reflex changes and pareses have been regarded as additional evidence for a diagnosis of nerve root involvement.

The more and more general acceptance of cervical nerve root irritation as a clinical entity has made the demands for accurate diagnosis increasingly more stringent, the more so since favourable results have been reported from various quarters in regard to surgical intervention in the form of removal of intervertebral disk material. Exact diagnostic methods are particularly important if the type of cervical disk surgery is to be accepted which entails an anterolateral excision when the surgeon has no possibility of seeing the lesion.

In the selection of the material presented below, we have in the first instance divided the brachialgia patients into two main categories, one of them comprising those with unimpaired shoulder mobility, the other including the cases with decreased mobility. From the former category we then selected those cases where the pain radiated down to one or more fingers, where the patients reported periodic stiffness of the neck, and furthermore had been unable to work for a fairly long time. We felt that it was in this group that we would be most likely to find evidence of cervical nerve root irritation. In co-operation with the Departments of Neurology, Neurophysiology, and Roentgenology, the patients were subjected to a neurologic, electromyographic, and roentgenologic-myelographic-discographic examination. The series presented here consists of 18 cases, 7 of which were treated operatively.

In the following, I will report the results of our examinations and attempt to draw some conclusions from our observations.



Fig. 1.

Lateral view of degenerated cervical disks between C5-C6 and C6-C7.

MATERIAL

A total of 18 cases, including 5 women and 13 men, were studied. The patients varied in age between 34 and 64 years. The duration of the symptoms was for 12 patients $1\frac{1}{2}$ –13 years. In 4 cases the symptoms were of less than one year's standing. In 9 cases, pain was felt in the right arm, in 7 cases in the left arm, in 2 cases the symptoms were bilateral. In all cases, the pain corresponded to one or more of the segments C6–C8.

The series was thus, for the greater part, made up of patients around 50 years of age with, in the majority of cases, symptoms of several years' standing. Shoulder joint mobility was without exception unimpaired. In all cases, the radiation of the pain down to the fingers permitted a classification by segmental involvement. The patients had all received routine conservative treatment including physical therapy, traction, and radio-therapy to the neck. In spite of this they were

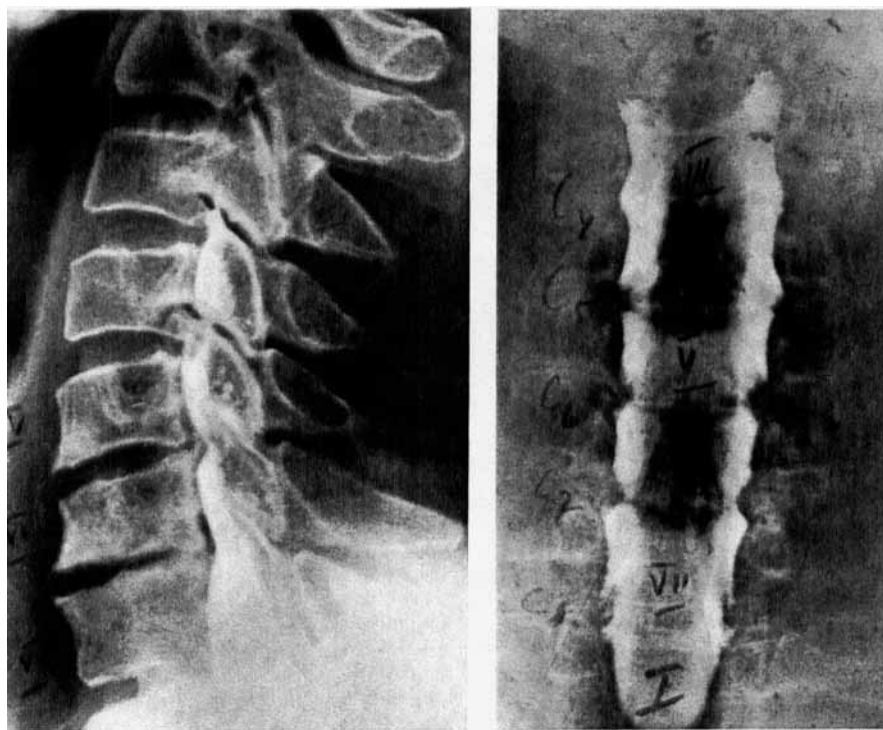


Fig. 2.

The myelographic appearance of the case from Fig. 2 in AP and lateral view. There are several defects on both sides between C4-C5, C5-C6 and C6-C7, mainly between C5-C6 and C6-C7.

greatly incapacitated and unable to work. Cervical sympathetic blocks had had no effect.

ELECTROMYOGRAPHIC EXAMINATION

The electromyographic study involved a various number of muscles in the hand, arm and shoulder and occasionally also the paravertebral muscles of the neck, innervated by the posterior branches of the spinal nerves. Spontaneous fibrillation potentials were regarded as main criteria for denervation but they were ascribed definite pathological significance only when they were abundant or when they occurred in conjunction with "positive sharp waves", fasciculation potentials or a reduced number of active motor units during voluntary contraction.

Electromyography was performed on ten patients and in five of them there were more or less obvious signs of denervation in one or

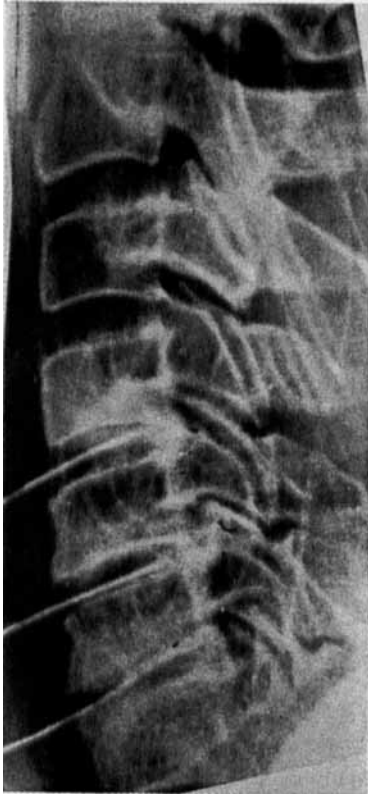


Fig. 3.

The same case as in the previous picture, now X-rayed while discography is performed during operation. In all the degenerated interspaces where the myelogram showed root compression there is a leakage of contrast posteriorly indicating prolapsed disks.

several muscles. In all these five cases myelography showed nerve root compression; in two of them (both operated) no pareses or reflex abnormalities were revealed by ordinary neurological examination.

Among those 5 patients where EMG provided no evidence for denervation, there were two which showed no root compression on myelography nor any pareses on neurological examination; two had a positive myelogram but no pareses and one (which was operated) had both a positive myelogram and a paresis.

Electromyographic examination, while constituting a valuable complement to the neurologic examination, can obviously not replace a careful clinical analysis (Hagbarth).

ROENTGENOLOGIC EXAMINATION

All patients were examined by roentgenography and myelography with Pantopaque. Details of these examinations are given in a separate paper by H. Lodin.

TABLE 1
Non-operated cases with negative myelogram.

Diary no.	Age	Sex	Duration of symptoms	Subjective symptoms in arms			Neurologic examination			Electromyographic examination	Roentgenographic examination Disk degeneration	Myelographic examination Nerve root compression
				Right	Left		Sensib.	Reflexes	Pareses			
02.07.30	57	♀	1 ½ years		C6		(+)	—	—	—	—	—
09.06.15	50	♀	2 years		C6		—	—	—	—	—	—
08.11.06	51	♂	3 years		C8		—	—	—	—	C3-C4 C5-C6	—
24.03.10	35	♀	4 years	C7			—	—	—	—	—	—
25.10.09	34	♀	5 years		C8		—	—	—	—	—	—

EVALUATION OF THE CLINICAL EXAMINATION

The myelogram was considered negative in 5 cases. In 4 of these the plain roentgenograms were normal. In only one case did they show evidence of disk degeneration. In none of these 5 cases could any objective signs of neurologic changes be found. In two cases an electromyogram was made, but these provided no evidence of disturbances (Table 1).

Table 2 presents 6 cases, in 4 of which the symptoms were of less than one year's standing. The roentgenograms showed in all cases signs of degeneration in one or several disks. In 4 cases in this group there was evidence of neurologic disturbances; in 3 cases electromyographic changes were found. The myelogram was positive in all cases, indicating space-occupying lesions at the level of one or more nerve roots. In 5 of the 6 cases the myelographic changes occurred on the same side as the pains in the arm. In half of the cases the myelographic findings confirmed the clinically estimated level of involvement.

In the last group (Table 3) which consisted of 7 cases, neurologic disturbances were found in all but two. In all cases there was evidence of disk degeneration and the myelograms were positive. In two of the myelograms, the level of involvement did not agree with that estimated on clinical examination.

Although it should be stressed that the small number of cases studied calls for caution in interpreting the findings, there seems to be a tendency towards agreement between roentgenologic disk degeneration, a positive myelogram, and neurologic disturbances. If the plain roentgenograms are negative and evidence of neurologic disturbances is lacking, it is fairly unlikely that myelographic examination will provide further information. If, on the other hand, there is evidence of both disk degeneration and clinical signs of nerve root involvement, the myelogram can be useful in establishing the level of involvement. The clinically estimated level does not always agree with the myelographic findings. Multiple contrast defects are remarkably common, which may explain the heterogeneous and indistinct clinical picture. It would seem that frequently several nerve roots are irritated simultaneously. Certainly it is impossible on the basis of the examinations reported here to define which of the contrast defects visible in the myelogram represents the active process. Under these circumstances there is no choice but to accept the idea of multiple disk ruptures.

TABLE 2
Non-operated cases with positive myelogram.

Diary no.	Age	Sex	Duration of symptoms	Subjective symptoms in arms		Neurologic examination			Electromyographic examination	Roentgenographic examination Disk degeneration	Myelographic examination Nerve root compression
				Right	Left	Sensib.	Re-flexes	Pareses			
09.12.18	50	♂	2 months	C6		+	—	—		C5-C6	C6
00.03.31	58	♂	4 months	C8		+	+	+	+	C5-C6 C6-C7	C6+C7 right
09.07.06	50	♂	7 months		+	—	—	—	—	C6-C7	C6 right
08.11.22	51	♂	10 months	C6+C7	C6+C7	—	—	—	—	C6-C7	C7 right
95.01.22	64	♂	5 years	C8	C6+C7+C8	+	—	+	+	C3-C4 C5-C6 C6-C7	C4 right+left C5 right+left C6 right+left
02.03.13	57	♂	5 years	C8		—	+	—	+	C5-C6-C7	C6+C8 right

TABLE 3
Operated cases.

Diary no.	Age	Sex	Duration of symptoms	Subjective symptoms in arms			Neurologic examination			Electromyographic examination	Roentgenographic examination	Myelographic examination	Operation	Length of follow-up in months after op
				Right	Left		Sensib.	Reflexes	Pareses					
18.05.08	40	♂	3 months	C6			+	—	—		C5-C6-C7	C7 right	C6-C7	12
18.06.29	41	♀	2 years	C6			—	+	+	—	C4-C5-C6	C5 right C6 right	C4-C5 C5-C6	9
08.03.13	51	♂	2 years	C6			+	—	—	C4-C6	C3-C4-C5-C6-C7	C5 right C6 right+left	C4-C5 C5-C6	8
03.07.23	56	♂	2½ years	+			+	—	+		C6-C7	C5 right+left C6 right+left C7 right+left	C4-C5 C5-C6 C6-C7	8
07.11.07	52	♂	3 years		C8		—	+	+		C3-C4-C5-C6-C7	C5 left C6 left	C4-C5 C5-C6	3
06.11.18	53	♂	6 years	C8			—	—	—		C5-C6-C7	C6 right+left C7 right+left	C5-C6 C6-C7	6
13.01.04	46	♂	13 years		C6		—	—	—	C8	C5-C6	C6 left	C5-C6	3

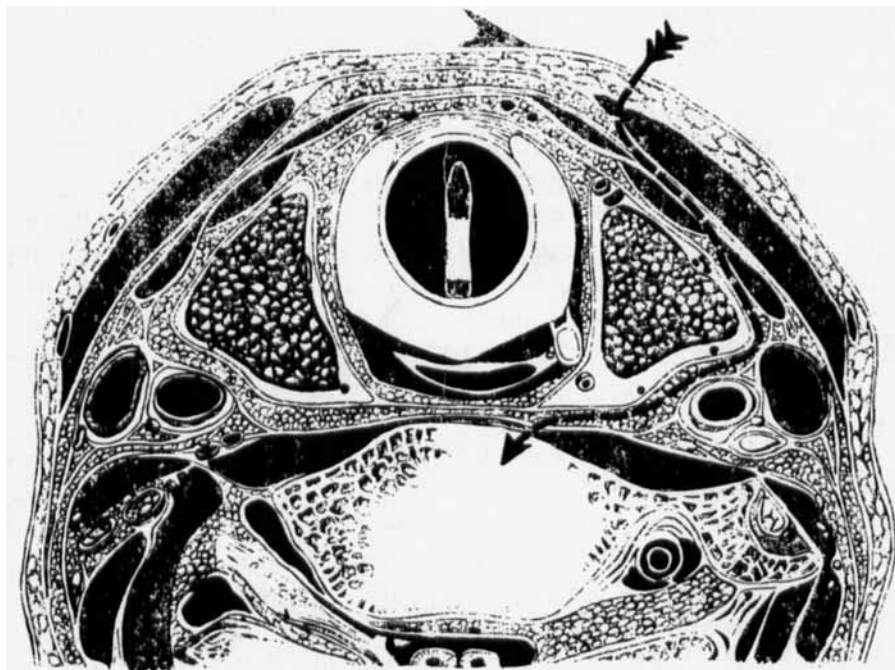


Fig. 4.
The surgical approach.

SURGICAL TECHNIQUE

So far, 7 of the patients with positive myelograms have been operated upon (Table 3). All patients were intubated and the operation performed in the supine position. The operation consisted of an antero-lateral partial disk excision according to the technique which in Sweden has been introduced by Lindblom-Olsson-Hult. The procedure is very simple. Incision is made along the sternocleidomastoideus muscle. Passing in front of the sternoclavicular muscle, the carotid sheath is moved laterally and it is then easy to penetrate into the layer of loose connective tissue which follows the course of the medial cervical fascia passing under the thyroid gland, the trachea, and the oesophagus to the deep fascia, fascia praevertebralis (Fig. 4). In this way the vertebrae and the ventrolateral aspects of the disks can be reached without any difficulty and without sharp dissection. By moving the prevertebral muscle structures slightly to one side, the disks become open to inspection. The level of the disk to be operated is then determined by means of localizing roentgenograms. Roentgenograms are taken with a needle inserted in

the disk. The desired interspace can then be localized without difficulty by using the needle as a point of orientation. Interspaces with myelographic evidence of nerve root compression were discographed, i.e. after anterolateral disk puncture one or two milliliters of 35 % abrodil was injected into the disk and roentgenograms were then taken in the A.P. and lateral projections. As a rule, but not always, the discograms agreed with the results of the myelographic examination. Discographic examination has been found to supply useful information for the ensuing operative course. A contrast leakage indicating severe degeneration of the posterior aspect of the annulus is a warning to the surgeon that the contemplated removal of disk material should be performed with the utmost care if undesirable lesions to the spinal cord are to be avoided.

As a first step in the anterolateral disk fenestration, an incision was made in the intervertebral disk with a knife. An opening usually measuring 3×5 mm. was made between the two vertebrae through which disk tissue was extracted by means of a chonchotome to a depth of 10 mm. As a rule the disk tissue could be extracted without difficulty and in no case was it necessary to force the instruments into the disks. Sometimes, in particular in cases with extremely narrowed interspaces, only a slight amount of tissue could be obtained and we had the impression that effective evacuation of such interspaces was hardly possible. From less strongly degenerated disks a greater quantity of tissue could be removed and usually it was found that the contents were under pressure which suggested that a true decompression had been achieved. The aim of the operation is, after all, a mechanical decompression.

The hole in the disk was left open. We are aware that some authors follow up the operation with an intracorporeal osteosynthesis, i.e. fill up the hole with osseous tissue. We have refrained from this, because the convalescent time must be longer if bony healing is to occur before the patient can go back to activity.

The removal of disk tissue does not cause any bleeding. Therefore no drainage was applied unless a risk of haematoma from surrounding vessels was suspected, in which case a thin rubber tube was inserted for 24 hours. The wound was closed by skin sutures only, after which simple compression was applied to the skin. We have not considered any immobilization support necessary.

The patient was allowed to leave his bed the day after the operation and could leave the hospital after two or three days. The sutures were removed later in the out-patient department.

Table 3 shows which disks were evacuated in each case. In five of the 7 cases tissue was removed from more than one disk.

IMMEDIATE RESULTS

In all cases the patient was on the first postoperative day entirely or for the greater part free of his brachial pains. In one case the pains returned to some extent, but even this patient considers himself improved. The immediate result has been remarkable and highly encouraging. Although the follow-up period is as yet not sufficiently long to warrant a final evaluation of the effect of the operation, we appear justified in continuing our surgical interventions. In no single case have any complications arisen or has the postoperative course given us cause to regret the operation.

SUMMARY

Patients suffering from shoulder-arm pain with unimpaired shoulder joint mobility and radiation of the pain down to one or more fingers have been subjected to a clinical, roentgenological, myelographic and discographic examination. When neurologic disturbances and roentgenologic evidence of disk degeneration in one or more intervertebral disks are found, they are often accompanied by a positive myelogram, although the clinically estimated level of involvement does not always agree with that established on myelographic examination. In many cases the myelogram disclosed multiple nerve root compressions, which may be regarded as an explanation of the difficulties encountered in establishing the exact level of involvement on clinical examination; obviously several nerve roots may be involved simultaneously, in contrast to the usual clinical picture in the lumbar spine. Nerve root irritation from cervical disks occurs at a higher age than in the lumbar spine. Since the frequency of disk degeneration increases with age, multiple disk degeneration and involvement of several nerve roots at different levels is to be expected.

In a selected number of cases, where the evidence of a positive myelogram agreed with the clinical findings, anterolateral disk fenestration was performed. The subjects were patients with shoulder-arm pains of long standing which had resisted other therapy.

During the course of the operation the level of the disk lesion was estimated by disk puncture and discographic examination. The disk fenestration was not followed by a cervical osteosynthesis. The immediate results have been good.

RESUME

Des malades souffrant de douleurs dans l'épaule et le bras alors que la mobilité de l'articulation de l'épaule était intacte et de douleurs rayonnant dans un ou plusieurs doigts, ont été soumis à un examen clinique, roentgenologique, myélographique et discographique. Lorsque des troubles neurologiques ou une dégénération évidente du disque dans un ou plusieurs disques intervertébraux sont découverts, ils sont souvent accompagnés d'un myélogramme positif bien que si l'on se base sur l'examen clinique le niveau de la lésion ne corresponde pas toujours à celui établi par l'examen myélographique. Dans beaucoup de cas, le myélogramme dévoile des compressions multiples des racines nerveuses qui doivent être considérées comme l'explication des difficultés rencontrées pour établir par l'examen clinique le niveau des vertèbres en cause. Apparemment plusieurs racines nerveuses peuvent être comprimées simultanément, contrairement au tableau clinique usuel dans les cas des disques lombaires. L'irritation de racines nerveuses des disques cervicaux apparaît à un âge plus avancé que ce n'est le cas des disques lombaires. Etant donné que la fréquence de la dégénération du disque augmente avec l'âge, on peut s'attendre à rencontrer une dégénération multiple de disques et plusieurs racines nerveuses en cause à des niveaux différents.

Dans un nombre de cas sélectionnés où le myélogramme positif correspondait aux trouvailles cliniques, une fenestration antérolatérale du disque a été pratiquée. Les sujets étaient des malades ayant des douleurs dans l'épaule et le bras depuis très longtemps qui avaient résisté à toute autre thérapie.

Au cours de l'opération, le niveau de la lésion du disque a été établi par une ponction discale et un examen discographique. La fenestration discale n'a pas été suivie d'ostéosynthèse cervicale. Les résultats immédiats ont été bons.

ZUSAMMENFASSUNG

Patienten, die bei uneingeschränkter Schultergelenksbeweglichkeit an Schulter-Armschmerzen mit Ausstrahlung zu einem oder mehreren Fingern litten, wurden klinisch, röntgenologisch, myelographisch und diskographisch untersucht. Wenn neurologische Störungen und röntgenologische Zeichen für eine Diskusdegeneration von einem oder mehreren Zwischenwirbelscheiben gefunden werden, sind sie oft von einem positiven Myelogramm begleitet, obwohl die klinisch angenommene Höhe des Ergriffenseins nicht immer mit der myelographisch ge-

fundenen übereinstimmt. In vielen Fällen deckte das Myelogram vielfache Wurzelkompressionen auf, ein Umstand der die Schwierigkeiten bei der klinischen Feststellung der genauen Höhe der Erkrankung zu erklären vermag. Augenscheinlich können mehrere Nervenwurzeln gleichzeitig ergriffen sein, im Gegensatz zu dem gewöhnlichen klinischen Bilde in der Lendenwirbelsäule. Nervenwurzelreizung durch Halswirbel-zwischenscheiben kommen in einem höheren Alter vor als dies in der Lendenwirbelsäule der Fall ist. Da die Häufigkeit der Diskusdegeneration mit höherem Alter zunimmt, ist mehrfache Scheibendegeneration und Ergriffensein von mehreren Nervenwurzeln in verschiedenen Höhen zu erwarten.

In einer ausgewählten Anzahl von Fällen, in denen ein positives Myelogram mit dem klinischen Befunde übereinstimmte, wurde eine anterolaterale Eröffnung der Scheibe ausgeführt. Die Operierten waren Patienten mit langdauernden Schulter-Armschmerzen, die jeder anderen Behandlung widerstanden hatten.

Während der Operation wurde die Höhe der Scheibenbeschädigung mittels Scheibenpunktion und Diskographie festgestellt. Der Diskuseröffnung wurde keine cervikale Osteosynthese hinzugefügt. Die unmittelbaren Ergebnisse waren gut.

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