Acta orthop. Scandinav. 38, 181–192, 1967

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POTT'S PARAPLEGIA TREATED BY ANTERO-LATERAL DECOMPRESSION IN THE THORACIC AND LUMBAR SPINE

A Report of Twenty-Seven Cases

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Received 27.II.67

When effective drugs for the treatment of tuberculosis made radical and successful surgery for tuberculosis of the spine possible, it seemed advisable that this active treatment should be centralized to hospitals in which special interest was taken in this field of surgery. In the Orthopaedic Hospital of the Invalid Foundation, radical operations for spinal tuberculosis were performed with good results, starting in 1949 (*Bakalim & A. Langenskiöld*). However, the results of the treatment of Pott's paraplegia were poor until the book on this subject published by *Griffiths, Seddon & Roaf* (1956) called attention to the possibility of antero-lateral decompression of the spinal cord in this condition (*Alexander* 1946). The detailed description of the operation given in the book mentioned and the results reported encouraged us to follow the advice given by its authors.

Since the first case of Pott's paraplegia was treated in our hospital by antero-lateral decompression in February 1958, twenty-seven patients have undergone this operation. All operations have been performed by the same surgeon (A. Langenskiöld). The results have confirmed the optimism of *Griffiths, Seddon & Roaf* expressed in 1956.

Not many series of cases treated by antero-lateral decompression have been published (*Hodgson et al., Paus, Ninh, Silva, Risko et al., Ingelrans et al.). Hodgson & Stock,* who reported the second largest series, had treated thirty-five cases. Single cases have been reported by *E. Kallio, Schultze* and *Weber. Kirkaldy-Willis et al.* contributed to the technique of operation (1965, 1966).

For the treatment of fresh tuberculous foci in the spine in adults, in 1960 we considered radical evacuation of the focus combined with interbody fusion at the same session the fastest way to recovery. However, having seen large progressive foci with abscesses heal within two to three months of drug treatment so that only scar tissue is found at operation, we tend to avoid unnecessary operations for tuberculosis of the spine. *Ingelrans & Lacheretz* had the same experience.

When paraplegia has occurred in Pott's disease the situation is different. The main purpose of operation is then the saving of the function of the spinal cord and not radical evacuation of the tuberculous focus. This is especially true when paraplegia occurs late in the disease. During the years when antero-lateral decompression has been practised at this hospital, several old patients with Pott's paraplegia in an early stage of spinal tuberculosis have been treated conservatively with a complete cure.

MATERIAL

The most important data concerning the twenty-seven cases are given in Table 7.

History. In twenty-one of the patients, paraplegia appeared more than three years after the onset of spinal tuberculosis. In three cases it appeared one to two years after the onset of spinal disease and three patients were paraplegic within five months after diagnosis of spondylitis (Table 1). Most of the patients were sent from other hospitals in the paraplegic state.

Preoperative condition and examination. Nineteen patients were males and eight females. Only four patients were operated on within two weeks of admission to the hospital, nine patients were operated on two to four weeks and nine patients four to eight weeks after admission. Five patients were operated on more than two months after admission. The timing of the operation depended on the estimated value of preoperative drug treatment and breathing exercises in relation to the danger of prolonged compression of the spinal cord in the individual case. The age distribution of the patients is shown in Table 1. The preoperative examinations included complete muscle testing of the trunk and the lower extremities, examination of the vital capacity of the lungs and of kidney function. Four of the patients had been treated earlier for urogenital tuberculosis. None of the patients had active tuberculosis of the lungs. All patients received full treatment with tuberculo-static drugs from admission to the day of operation.

The entire spine was radiographed and the kyphotic area was tomographed in two planes. Side view tomography proved especially valuable for planning of the operation. Myelography was considered contra-indicated and of no value in this group of cases.

In only one of seven patients in which no active tuberculosis was found at operation was the sedimentation rate of the blood slightly elevated before operation. On the other hand, several patients had a normal sedimentation rate in spite of active spinal foci being present.

Table 1. Duration of Skeletal Disease before the Appearance of Paraplegia.

Skeletal disease present	Results of treatment of paraplegia			
	Complete recovery	Improved	No improvement	Death
1 to 5 months	3			
1 to 2 years	1	1	1	
3 to 7 years	2		3	
11 to 14 years	5		1	1
18 to 22 years	3	1		
32 to 45 years	5			
Total	19	2	5	1

Table 2. Age at Time of Surgical Intervention.

Age (years)	No. of cases
15 – 20	5
21 – 30	6
31 – 40	7
41 – 50	5
51 – 60	1
61 – 70	3
Total	27

The degree and duration of motor paralysis are shown in Table 3 and the level and extension of spinal tuberculosis in Table 4. Only for a few of the first patients was a plaster bed made before operation. Later the use of plaster beds in the treatment of tuberculosis of the thoracic or lumbar spine was discarded.

Operation. The excellent description of the technique of antero-lateral decompression in Pott's paraplegia given by *Griffiths, Seddon & Roaf* in 1956 formed a firm basis on which the use of this procedure could be started with success in the first cases. In the main, the technique described and the advise given by the authors mentioned have been followed in this series of cases.

In three cases decompression was carried out in the lumbar spine, in the other cases in the thoracic spine. The operative findings in the twenty-seven cases are shown in Table 5. As the onset of paraplegia had been late in most cases, it is not surprising that bony ridges or hard bony sequestra were the main compressing factors in twenty-five of them. The statement of *Griffiths, Seddon & Roaf* that the compressing agent will always be found at the region of the apex of the kyphosis was confirmed.

The distance at which the anterior aspect of the cord had to be decompressed varied. In one case seven spinal roots had to be exposed, in one case six roots, in ten four roots, in seven three roots and in one case only two roots. In a few cases

Table 3. Results According to the Duration of Motor Paralysis.

Severity and duration of motor paralysis	Complete recovery	Improved	No improvement	Death
Complete motor loss:				
14 days – 1 month	8			
1 month – 4 months	2		1	
4 months – 7 months	1			
7 months – 1 year		1		
1 year – 2 years			1	
4 years – 7 years			3	
Incomplete motor loss:				
3 months – 4 months	2			1
6 months – 8 months	4			
1 year – 2 years	1			
3 years	1			
14 years		1		
Total	19	2	5	1

Table 4. Level of Lesion in the Spine.

Level	Complete recovery	Improved	No improvement	Death
Disease between				
T. I and T. X			1	1
T. IV and T. X			1	
T. V and T. VI	2			
T. V and L. I	4		1	
T. VI and T. XII	6	1	1	
T. VIII and T. XI	1	1	1	
T. X and T. XII	2			
T. XI and L. V	3			
T. XII and L. IV	1			
Total	19	2	5	1

the dura was covered by firm fibrous tissue which had to be peeled off to achieve decompression.

When dealing with firm bony ridges compressing the cord from the anterior aspect in this series of cases, it was found advantageous to remove the internal gibbus with a chisel, leaving a shell of bone between the resulting cavity and the spinal cord. This should be done when the pedicles separating the intervertebral

foramina have been removed and the anterior aspect of the dura has been located along the length necessary in the particular case. When most of the internal gibbus has been removed the thin bony roof between the cavity and the spinal cord can be broken down into the cavity with minimal risk of additional damage to the cord.

With some exceptions to be described below, pulsation of the dura could be seen to have returned after decompression.

In several cases, one to three of the intercostal nerves were so thin and atrophied that they had to be sacrificed for the efficacy of the operative work.

At the operation, decompression of the cord was aimed at and not radical evacuation of tuberculous foci. These were in many cases to wide-spread to be dealt with radically (cf. Figure 2).

In seven patients no active tuberculous focus was found at the operation. Three of these patients (Nos. 12, 14 and 15) were cured by the antero-lateral decompression. It seems obvious that degeneration of intervertebral disks or stress on de-

Table 5. Results Obtained According to Cause of Compression.

Cause of compression	Complete recovery	Improved	No improvement	Death
Pus and granulation tissue	2			
Bony ridge or hard sequestra with pus and granulation tissue	6		2	
Bony ridge or hard sequestra with granulation tissue	8	1	1	
Bony ridge without granulation tissue	3	1	2	1
Total	19	2	5	1

Table 6. Age of Patients at the Antero-Lateral Decompression Operation.

Age (years)	Complete recovery	Improved	No improvement	Death
15 – 20	2		2	1
21 – 30	3	2	1	
31 – 40	6		1	
41 – 50	5			
51 – 60	1			
61 – 70	2		1	
Total	19	2	5	1

formed vertebrae may provoke compression of the cord in kyphotic spines after complete healing of the tuberculous process.

Complications at operation. Perfect service from the anaesthetists was available at and after all operations, which tended to reduce the frequency of complications. Bleeding during exposure of the ribs was reduced by injecting diluted solution of adrenaline into the tissues before incision. Rupture of intercostal arteries occurred frequently, but bleeding was always controlled by diathermy, fibrin foam and thrombin solution.

In four cases rupture of the dura occurred without serious consequences.

Rupture of the pleura occurred in three cases (Nos. 1, 5 and 23). In all of them a catheter was left in the pleural cavity and withdrawn after suction following closure of the wound. However, in one cases (No. 5) severe atelectasis of both lungs followed, resulting in death. This was one of the few patients who were not postoperatively treated in a special ward staffed by personnel trained in the after care of patients who have undergone thoracic surgery. Severe kyphosis, which was present in this case, creates a predisposition for atelectasis. *Griffiths, Seddon & Roaf* also considered rupture of the pleura a serious accident in this group of cases. If rupture of the pleura occurs in patients with excessive kyphosis, we recommend that continuous suction of the pleural cavity should be maintained for several days.

Postoperative care. It was found to be more advantageous to provide some mobility of the patient in a recumbent position than to immobilize him in a plaster bed immediately after operation. During the first few days, the patients were positioned lying on the operated side to promote function of the contralateral lung.

The time of recumbency varied, largely depending on the operative findings and the course of recovery. The shortest time from operation to walking was one month, (No. 27), a patient who recovered rapidly from incomplete loss of motor function and who had a stable row of vertebral bodies.

It was generally felt that recumbency for more than three months would be more harmful than raising the patient in a tilting-bed after this time.

When no tuberculous focus was found at operation, tuberculostatic drugs were not given postoperatively. In the other cases, drug treatment generally continued for two years.

Reoperation for failure to respond to antero-lateral decompression. In two cases, re-exposure of the spinal cord was considered indicated. In one case, (No. 7), the dura had been found to be thickened and firm at decompression and pulsation did not appear. As it was surrounded by pus, opening the dura was considered contra-indicated. When no return of motor function could be seen three months later, the spinal cord was re-exposed and the dura was opened longitudinally for a distance of about five centimeters and left open. Two weeks later, motor function started to return but the recovery from paraplegia was incomplete.

In a woman aged 65 years no return of motor function was seen three months after adequate decompression of the cord (No. 22). The spinal cord was re-exposed three and a half months after the first operation. No compression was found and the dura was incised longitudinally and left open. Pulsation in the cord was seen. Motor function did not return.

Spinal fusion. Anterior spinal fusion was not attempted in any of the cases. In

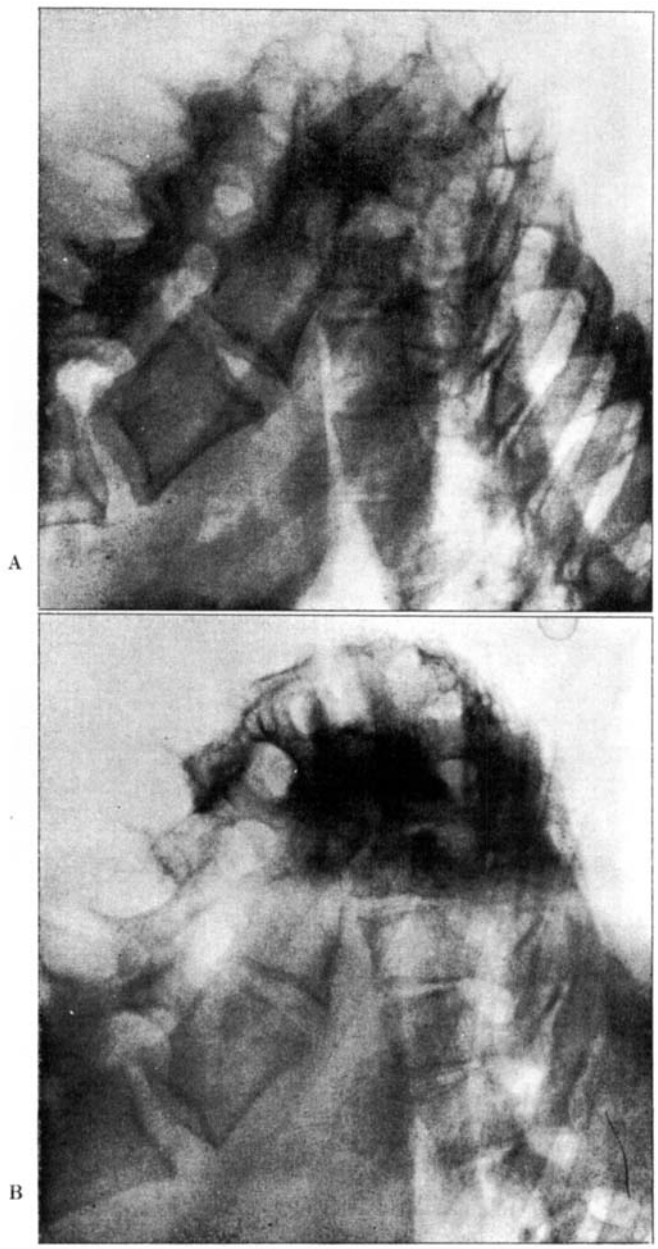

Figure 1. A. Case No. 14. Side-view radiograph of the kyphotic area before antero-lateral decompression. B. Side-view radiograph after decompression. In this case posterior fusion was not considered necessary.

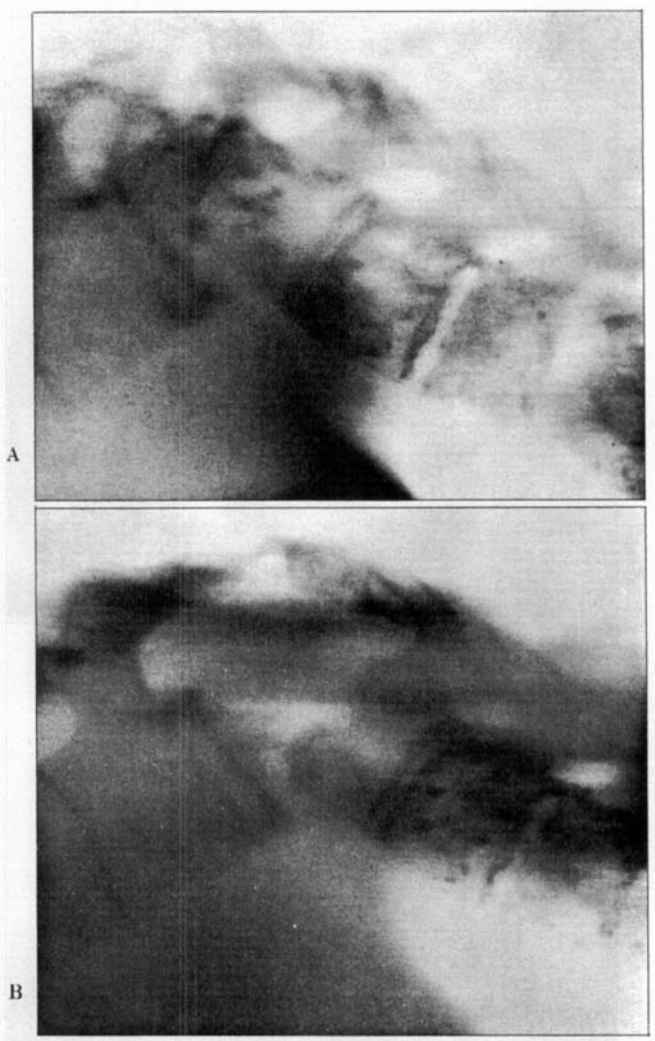

Figure 2. A. Case No. 21. Sideview tomograph of the kyphotic area before anterolateral decompression. B. Side-view tomograph after decompression. Internal gibbus radically removed, leaving an unstable row of vertebral bodies. Adequate posterior fusion had been carried out at an earlier stage.

eleven cases, posterior fusion was carried out two to four months after anterolateral decompression. In one case, posterior fusion was performed five months after decompression and in another, seven months.

In the cases which did not show signs of recovery from paraplegia after operation (Nos. 9, 10, 17, 19 and 26) spinal fusion was not considered indicated. In two cases, advanced age was considered a contra-indication for prolonging the period

of recumbency by a fusion operation (Nos. 11 and 23). In two cases, spinal fusion had been carried out before paraplegia indicated antero-lateral decompression (Nos. 13 and 21) and in four cases, the row of vertebral bodies was considered stable enough to render posterior fusion unnecessary (Nos. 14, 15, 18 and 27, cf. Figure 1).

After posterior fusion performed by implanting tibial or iliac bone grafts on the laminae on both sides of the spinous processes, the patients were recumbent for about two months.

RESULTS

The results of antero-lateral decompression in the present series of cases are shown in the Tables 1 and 3–7. In nineteen patients, the motor function and the sensation of the lower extremities returned to normal with normal reflexes and a negative Babinski test. One patient (No. 5) who might have had a good chance of recovery from adequate decompression, died on the fifth postoperative day from complications due to rupture of the pleura at operation. Autopsy showed extensive atelectasis of both lungs to have been the cause of death.

In two patients, function clearly improved as a result of the operation (Nos. 7 and 26). In five patients, no improvement was seen after decompression. Two of these (Nos. 9 and 10) were young boys who had been completely paraplegic for more than eight years. Seeing other patients recover from a similar condition, they wanted to take the chance of improvement by operation although it seemed very slight. Both are now working in wheelchairs as television technicians. In one patient aged 65 years (No. 22), reoperation showed that decompression had been adequate.

In one patient with paraplegia of long standing, operation had been refused one year earlier because chances of recovery were considered non-existent. However, pain and continuous elevation of the sedimentation rate of the blood in spite of drug treatment indicated operation. The internal gibbus with an active tuberculous focus was removed. The sedimentation rate dropped to normal and the general condition of the patient improved although paraplegia remained (No. 25).

In one patient, slowly progressing paraplegia from a bony ridge without active tuberculosis did not respond to operation in spite of adequate decompression of the spinal cord (No. 17).

Considering the primarily bad prognosis in four of the five unsuccessful cases, the results obtained by antero-lateral decompression in this series support the enthusiasm of *Griffiths, Seddon & Roaf* as to the value of this operation as a treatment for Pott's paraplegia.

SUMMARY AND CONCLUSIONS

Twenty-seven cases in which antero-lateral decompression of the spinal cord was carried out for Pott's paraplegia are reported.

Nineteen patients recovered, attaining full function of the lower extremities. One patient died from atelectasis of both lungs following rupture of the pleura at operation. In two patients, mobility was improved by operation, and in five cases the paraplegic condition remained unchanged. In two of these five, paraplegia of many years duration rendered recovery from operation improbable, and in two cases slow progression of paraplegia over a number of years motivated a guarded prognosis. In one case, reoperation revealed adequate decompression but no function returned.

Antero-lateral decompression is considered the treatment of choice for paraplegia of late onset in Pott's disease. The prognosis seems to be favourable when the operation is radically and carefully carried out before complete motor loss of the lower extremities has been present for more than seven months. Incomplete motor loss may be cured even years after onset of paresis.

When removing a bony ridge compressing the spinal cord from the anterior aspect, it has been found advantageous to remove the internal gibbus, first leaving a shell of bone between the resulting cavity and the dura. The last step of decompression can then be carried out by breaking this thin shell down into the cavity with minimal risk of operative damage to the cord.

RESUME

Il est rapporté vingt-sept cas dans lesquels une décompression antéro-latérale du cordon médullaire a été pratiquée pour remédier à une paraplégie du Mal de Pott.

Dix-neuf malades furent guéris et retrouvèrent l'entière fonction des extrémitée inférieures. Un malade est décédé d'atélectasie des deux poumons due à une rupture de la plèvre pendant l'opération. Chez deux malades, la mobilité a été améliorée par l'opération et dans cinq cas l'état paraplégique est resté inchangé. Chez deux des cinq, une paraplégie qui durait depuis plusieurs années rendait improbable une guérison par l'opération et dans deux cas une lente progression de la paraplégie à travers un certain nombre d'années motiva un pronostic prudent. Dans un cas, une nouvelle opération montra que la décompression voulus se produisait bien, mais sans qu'il intervint un retour de la fonction.

La décompression antéro-latérale est considérés comme le traitement de choix de la paraplégie dans les attaques tardives du Mal de Pott. Le pronostic semble être favorable lorsque l'opération est radicale et minutieusement exécutée avant qu'une perte complète de la force motrice des extrémités inférieures ait duré plus de sept mois. Une perte incomplète de la force motrice peut être quérie même plusieurs années après une attaque de parésie.

Lorsqu'il est enlevé un pont osseux comprimant le cordon médullaire du côte antérieur, il est avantageux d'enlever la gibbosité interne en laissant d'abord une écaille osseuse entre le cavité qui se produit et la dure-mère. Le dernier stade de la décompression peut être pratiqué en brisant cette mince écaille dans la cavité avec un risque minime de dommages opératoires du cordon médullaire.

ZUSAMMENFASSUNG

Siebenundzwanzig Fälle, in denen eine antero-laterale Dekompression des Rückenmarks wegen Paraplegie bei Wirbeltuberkulose ausgeführt wurde, werden beschrieben.

Neunzehn Patienten genasen vollständig und bekamen eine vollständige Funktion der unteren Extremitäten wieder. Ein Patient starb von Atelektase beider Lungen nach Ruptur der Pleura bei der Operation. Bei zwei Patienten wurde die Beweglichkeit von der Operation gebessert und in fünf Fällen blieb der Zustand unverändert. In zwei von diesen fünf war eine Genesung nach mehrjähriger Paraplegie unwahrscheinlich und in zwei Fällen machte eine langsame Progredienz der Paraplegie während mehreren Jahren die Prognose unsicher. In einem Fall zeigte eine Reoperation, dass die Dekompression nach der ersten Operation vollständig war aber eine Besserung der Funktion der Gliedmassen trat nicht ein.

Die antero-laterale Dekompression ist die Methode der Wahl bei der Behandlung einer Paraplegie die spät im Verlauf der Wirbeltuberkulose auftritt. Die Prognose scheint günstig zu sein wenn die Operation radikal und mit Vorsicht ausgeführt wird vor eine vollständige Lähmung der unteren Gliedmassen mehr als sieben Monate vorhanden gewesen ist. Eine unvollständige Lähmung kann auch nach jahrelangem Bestehen behoben werden.

Bei der Entfernung einer knöchernen Kante, die das Rückenmark von der Vorderseite komprimiert, hat man es vorteilhaft gefunden den inneren Gibbus zuerst mit dem Zurücklassen einer dünnen Knochen-

schicht zwischen der entstehenden Kavität und dem Rückenmark auszuführen. Der letzte Schritt der Dekompression ist dann durch das Brechen der dünnen Knochenschicht in die Kavität hinein mit einem minimalen Risiko für eine Schädigung des Rückenmarks durchgeführt.

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