Operations for the unstable cervical spine in rheumatoid arthritis

Sixteen cases of subaxial subluxation

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Sixteen patients with seropositive rheumatoid arthritis were operated on for subaxial subluxations. Four of the patients had slight, but progressive, tetraparesis, and 5 had severe or total tetraparesis; they were operated on 1–4 months after the first signs. Seven patients were treated for severe neck and shoulder pain. Nine patients had subluxation at the C3–4 level, the most common site, and 3 patients also had an atlantoaxial subluxation. Patients with cord compression were treated with posterior laminectomies and fusions that relieved the tetraparesis. Two patients died during the early postoperative period: 1 of a cardiac infarction and the other of pneumonia. During 4 (1.5–9) years' follow-up, 3 patients had new subluxations at other levels.

Most of the rheumatoid subluxations occur in the upper part of the cervical spine (Bland 1967, Cabot and Becker 1978, Brattström 1986, Santavirta et al. 1988a). Patients with long-term rheumatoid disease, however, occasionally have subaxial subluxations (Redlund-Johnell 1984). The necessity of operative management of rheumatoid subaxial problems has been recognized for years (Kankaanpää and Santavirta 1985, Santavirta et al. 1988b), but only little has been reported on the outcome of treatment. We report our 4-year results in 16 cases.

Patients and methods

From 1974 to 1985, inclusive, in the Division of Orthopedic Surgery and Traumatology, Surgical Hospital, University Central Hospital, Helsinki, we operated on 16 patients with seropositive rheumatoid arthritis for subaxial subluxations in the cervical spine (Table 1). The patient's median age was 53 (41–66) years; 4 were men and 12 were women. The average duration of rheumatoid disease at the time of operation was 18 (7–34) years. Fifteen of the patients had suffered from severe neck or shoulder pain for an average of 4 years. All except 2 of the patients had undergone 5 or more operations for arthropathy.

When attending the hospital, the patients' neurologic status was classified according to Ranawat et al. (1979) as follows: 6 patients belonged to Class I and 1 to Class II (intolerable neck and shoulder pain); 4 patients belonged to IIA (slight, but rapidly progressing tetraparesis); and 5 patients belonged to IIB (severe or total tetraparesis).

Four of the patients were bedridden owing to recent onset of subtotal tetraparesis, 3 required a wheelchair, 5 were able to walk with crutches, and 4 walked without aid. Seven patients had a positive Lhermitte sign, i.e., electric-like sensations along the spine while moving the head. Hyperreflexia was found in 10 patients, and a positive Babinski sign in 6. Altogether, 9 patients had tetraparesis. One patient (Case 7) had urinary incontinence.

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Table 1. Data on 16 patients with rheumatoid subaxial subluxation of the cervical spine

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	F	65	34	+	+	1–2, 5–6	II	–	4	1	–	–	G, 5–6	2	–	–	–	–	2w	1
2	F	51	19	+	+	3–4	IIIB	4	1	2	–	3	3–4	4	II	3	2	–	3y	–
3	M	53	17	+	+	-2, 3–4	IIIA	4	3	2	+	3–4	G, 1–5	8	I	4	5	–	–	–
4	M	57	12	+	+	3–4	IIIA	16	2	2	–	3–4	2–5	6	II	3	1.5	–	–	2
5	F	66	16	+	+	3–4	IIIB	7	1	2	+	3	2–5	6	II	4	2.5	–	–	–
6	F	44	19	+	+	5–6	IIIB	12	2	2	+	5–6	3–7	3	II	3	3.5	–	–	–
7	F	55	18	+	+	3–4	IIIB	3	1	2	+	3	2–5	8	II	3	8	+	10y	–
8	F	42	17	+	+	3–4	I	–	3	1	+	3	2–5	–	I	3	9	–	–	–
9	M	64	34	+	+	3–4	IIIA	8	2	2	–	3	3–5	–	I	3	8	–	9y	–
10	F	48	15	+	+	3–4	I	–	4	1	+	–	2–4	–	IIIB	2	9	+	11y	–
11	M	51	18	+	+	6–7	I	–	4	1	–	–	6–7	–	I	4	7	+	–	–
12	F	41	12	–	+	3–4	IIIA	16	3	2	+	3–4	2–5	–	I	4	4	–	–	–
13	F	63	21	–	+	6–7	I	–	3	1	–	–	6–Th1	–	I	3	7	–	-	–
14	F	51	18	–	–	5–6	I		3	1	–	–	4–7	–	II	4	2	–	2y	–
15	F	50	13	–	+	3–5	I	–	4	1	–	–	2–6	–	I	4	2	–	3y	–
16	F	52	7	+	–	-2, 6–7	IIIB	8	1	2	-	–	G, 6–7	5	–	–	–		10w	3

A case
B sex
C age
D duration of rheumatoid disease (years)
E cortisone more than 3 years
F more than four previous operations
G level of subluxation
H Ranawat class preoperatively
I duration of preoperative tetraparesis (weeks)
J preoperative mobility
  1 bedridden
  2 wheelchair
  3 crutches
  4 without aid
K main reason for operation
  1 pain in neck and shoulders
  2 symptoms of cord compression
L Lhermitte's sign preoperatively
M laminectomy and level
N type of spondylodesis: G atlantoaxial
O duration of postoperative skull traction (weeks)
P Ranawat class at follow-up
Q mobility postoperatively
R duration of follow-up (years)
S postoperatively subluxation at another level
T death (time after operation)
U postoperative complication
  1 heart infarction
  2 duodenal ulcer
  3 pneumonia

Ten patients who had II–IIB neuropathy had paresthesias of the hands, and 8 of them also had paresthesias of the trunk and lower extremities. The most severe neurologic lesions had usually progressed rapidly from Class II to Class IIIA or IIIB, and the patients with tetraparesis were operated on 1–4 months after onset of the first signs. Radiographically, a C3–4 subluxation was most prevalent. In addition to the subaxial subluxations, Case 16 had an anterior atlantoaxial subluxation, Case 1 a vertical atlantoaxial subluxation, and Case 3 a posterior atlantoaxial subluxation. Preoperatively, the patients had a cervical myelography that after 1979 was combined with computed tomography in Cases 1–7.

Seven patients, 6 of whom had severe pain and no neurologic defects, had posterior fusion without laminectomy; in 3 patients, this included more than two segments. The other 9 patients had laminectomies; in 5 cases resection of the C3 arch and in 4 cases removal of two posterior arches (Figure 1). In each laminectomy, granulation tissue and a fibrotic-constricting membrane, resembling rheumatoid pachymeningitis over the dura, were observed, presumably contributing to the spinal cord compression.

The fusion was made posteriorly with cancellous bone chips and a solid graft. When needed, wiring was performed, not to increase the immediate stability, but to secure the position of the posterior graft. Cases 3 and 16 had an additional Gallie-type atlantoaxial fusion of the concomitant C1–2 subluxation (Figure 2). Case 1 had a laminectomy of the atlas and occipitocervical fusion due to a vertical atlantoaxial subluxation.

The patients were evaluated on an average 4.4 (1.5–9) years after surgery.

Results

Two patients died during the early postoperative period: Case 1 of a coronary infarction on the 15th postoperative day and Case 16 from Staphylococcus septicemia and pneumonia. Six patients died during the follow-up period of cardiac failure; the deaths

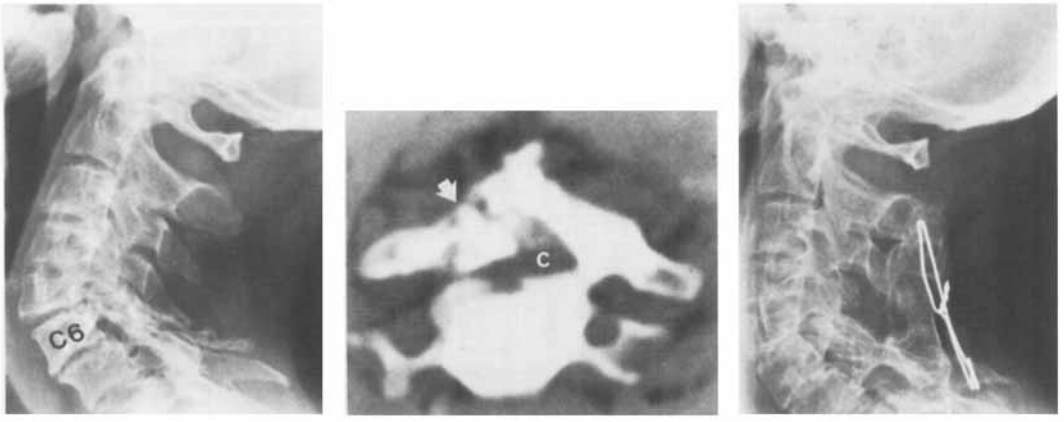

Figure 1. Case 6. A 44-year-old woman with a 19-year history of seropositive rheumatoid disease and sudden onset of rapidly progressing tetraparesis.

A. Disc and vertebral bone destruction at the C6 level.

B. Computed tomography reveals spinal cord (C) compression at the C6 level, as well as destruction of the posterior arch (arrow).

C. Thirteen months after a C5–6 laminectomy and posterior fusion, which is well united. The patient showed good clinical recovery.

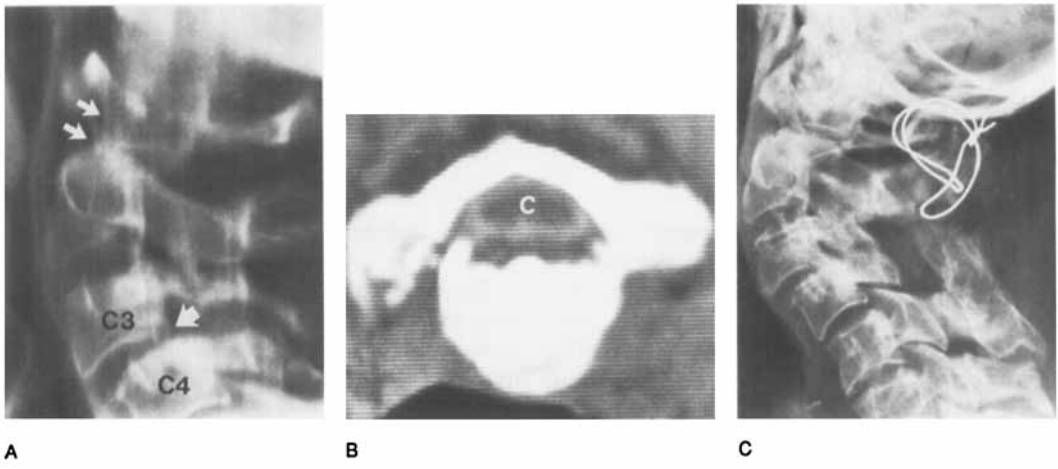

Figure 2. Case 3. A 51-year-old woman with rapidly impending tetraparesis after a 17-year rheumatoid history.

A. Lateral tomography reveals a C3–4 subluxation (large arrow) and destruction of the odontoid process (two arrows), as well as a potential posterior atlantoaxial subluxation.

B. Computed tomography confirms cord compression at the same level (C compressed and reniform cord).

C. Five years postoperatively, both the Gallie-type atlantoaxial fusion and the fusion between C1 and 5 posteriorly after C3–4 laminectomies are well ossified.

were not related to the cervical disease.

Eight patients had skull traction postoperatively for 2 to 8 weeks. In each case the fusion was judged to be successfully ossified at follow-up.

Three patients were operated on twice. In Case 7 because of rapid onset of tetraparesis, a C3 laminectomy complemented with a C2–5 fusion was performed. The patient recovered completely, and the fusion was considered to be successfully ossified. Seven years later, severe kyphotic destruction was found between C5 and C6, but the patient had no neurologic defects (Figure 3). The patient was treat-

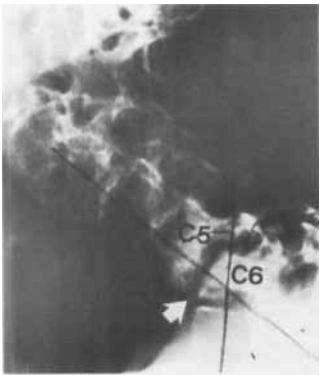

Figure 3. Case 7. A 55-year-old woman 7 years after a primarily successful C3 laminectomy and C2–5 fusion, with kyphotic destruction (arrow) below the fused segment. There was little pain and no paresis.

ed for this condition with a C4–7 posterior fusion. Case 10, 8 years after a C2–4 fusion, had a new subluxation below the fusion level accompanied by tetraparesis, which was relieved by a new fusion operation. Case 11 had had a Gallie C1–2 fusion 2 years before the C6–7 fusion. Five years later, there was subluxation at the C2–3 level, which was fused, and the patient has not had cervical symptoms.

In the follow-up the patients' initial neurologic condition was generally found to have improved; 7 patients belonged to the RI class and 6 to RII (Table 1). In 2 of the 6 patients with a preoperatively positive Babinski sign, this disappeared with the management. The tetraparesis was relieved in 8 of 9 patients (Case 16 died).

All except 1 (Case 10) of the patients who had been operated on because of pain were relieved of this at the follow-up.

Five patients had a normal gait without auxiliary devices, and 8 patients needed two crutches. The condition of Case 10, initially without neurologic defects, deteriorated and 9 years postoperatively she was bound to a wheelchair.

Discussion

Subaxial subluxations are usually late features in aggressive forms of rheumatoid disease. The clinical condition of these patients is often difficult to evaluate because their disease may be complicated by peripheral joint destruction, peripheral neuropathies, nerve entrapments, rheumatoid myopathy, and rheumatoid vasculitis (Santavirta et al. 1987a, b, Konttinen et al. 1988).

The course of the rheumatoid disease in the cervical spine is largely unpredictable. Destruction of the cervical ligaments progresses gradually (Konttinen et al. 1987a), and degeneration of the subaxial discs and facet joints follows later (Bland 1967, Redlund-Johnell 1984). However, in several patients in our series the onset and progress of the neurologic lesions were rapid, and progressive tetraparesis led to operations of the cervical spine.

Subaxial subluxations in the rheumatoid cervical spine are often multiple, and in some cases there is a coexisting atlantoaxial subluxation (Laasonen et al. 1985). In subaxial lesions, cervical myelography indicates the level of the compression and computed tomography quantitates it. Subaxial compression of the neural elements can also be caused by soft tissues, such as rheumatoid pachymeningitis, arachnoiditis, pannus formation, or extradural rheumatoid nodules (Bland 1967, Crockard et al. 1985, Konttinen et al. 1987b). These can best be detected with nuclear magnetic imaging.

In rheumatoid patients, anterior procedures for decompression of the spinal cord have given good results in some cases (Crockard et al. 1985). However, because of vertebral osteoporosis, they often fail (Ranawat et al. 1979). The use of acrylic cement and metallic rods for additional stabilization has been advocated (Zoma et al. 1987), but we find no use for these techniques in rheumatoid patients. In our opinion, reduction of the subluxation combined with posterior fusion cannot be recommended in patients with signs of cord compression, because in the present series laminectomy disclosed rheumatoid granulation tissue in the sublaminar space, suggesting that this tissue may cause compression of the neural elements. The use of posterior fusions without laminectomy should be limited to those patients who have severe chronic neck and shoulder pain but no signs of cord compression.

In our series, posterior decompression resulted in satisfactory recovery. However, destruction of vertebral bone developed later in 1 patient just below the fusion and another 2 had new subluxations. There is a risk of a new subluxation below or above the fusion caused by the mechanical stress from segmental spondylodesis.

On the basis of our experience, we recommend operative treatment for progressive tetraparesis. It appears that posterior decompression combined with posterior fusion can give satisfactory results, although with the risk of new subluxations above and below the fusion.

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