Rushpin fixation for midshaft clavicular nonunions

Good results in 13/14 cases

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We treated 14 patients having a symptomatic midshaft clavicular nonunion with intramedullary Rushpin fixation and autogenous bone grafting. 13 nonunions healed within 4 months. There were no complications related to the operation. After a mean follow-up of 40 (4–156) months, shoulder function (Constant-Murley score) was 90 (44–100)%, compared to the contralateral shoulder. Rushpin fixation with autogenous bone grafting is a simple and reliable method for treating nonunions of the midshaft of the clavicle.

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We reviewed the functional outcome of 14 consecutive patients having a symptomatic clavicular midshaft nonunion treated with intramedullary Rushpin fixation and autogenous bone grafting.

Patients and methods

Between 1981 and 1996 we treated 14 patients (4 women) for symptomatic nonunion of the clavicle with intramedullary Rushpin fixation and autogenous bone grafting (Table). Their average age at the time of operation was 38 (19–83) years. All fractures were closed and resulted from different kinds of injuries. In 7 patients, they were caused by high-energy trauma. The dominant side was involved in 7 patients. 6 patients had associated injuries, 2 of them a scapular fracture. 1 fracture was comminuted. No neurovascular lesions were documented. Primary treatment in all patients had been a sling for 2–6 weeks. The nonunions occurred in the middle third of the clavicle. 11 nonunions were atrophic, 3 hypertrophic. The average time between initial injury and operation was 20 (4–63) months.

In all patients, open reduction and internal fixation was performed through a horizontal incision over the anterosuperior aspect of the clavicle. After removal of sclerotic bone and fibrous tissue, the intramedullary canal was predrilled to both sides and thereafter a Rushpin was inserted from lateral to medial (Figure). Autogenous bone grafts from the iliac crest were placed at the site of the nonunion after decortication. 6 patients were immobilized postoperatively with a velpeau bandage, 8 patients rested the arm in a sling for the first 4–6 weeks.

After a mean follow-up of 40 (4–156) months, a questionnaire was answered, followed by physical and radiographic examinations of both shoulders. The Constant-Murley (1987) shoulder score was used to evaluate both shoulders. We used a handheld dynomometer to measure isometric strength of the shoulder at 90 degrees of combined abduction and elevation.

Results

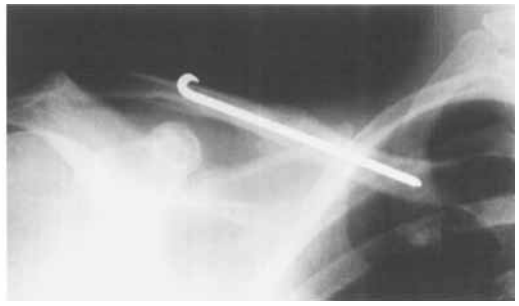
13 of the 14 clavicular nonunions healed within 4 months after the operation. There were no complications related to the operation. The mean Constant score of the involved shoulder at follow-up was 90 (44–100) (Table), the score of the contralateral shoulder varied between 95 and 100. We observed no neurologic dysfunction or thoracic outlet signs at follow-up.

Data on 14 cases with clavicular nonunion treated with Rushpin fixation and autogenous bone grafting

Case	A	B	C	D	E	F	G	H	I	J	K	L
1	M	26	L	H	13	5	10	20	40	17	87	y
2	M	47	L	A	5	57	15	20	40	23	98	y
3	M	30	L	A	27	103	15	20	40	21	96	y
4	M	31	R	A	63	14	15	20	40	25	100	y
5	M	57	L	A	16	10	15	20	40	22	97	y
6	M	39	L	A	18	156	15	20	40	21	96	y
7	F	48	L	A	5	8	5	10	16	13	44	n
8	F	30	R	H	13	39	15	20	40	21	96	y
9	F	20	R	A	61	39	15	18	40	25	98	y
10	F	19	L	A	4	4	15	20	40	22	97	y
11	M	28	L	H	23	38	10	20	40	23	93	y
12	M	33	L	A	13	62	15	20	40	23	98	y
13	M	83	L	A	7	4	15	20	32	25	92	y
14	M	43	R	A	11	13	10	14	34	21	79	y

A Sex
B Age at operation
C Side of involvement
D Atrophic/hypertrophic nonunion
E Time from injury to operation
F Follow-up, months
G Pain at follow-up
H ADL at follow-up
I ROM at follow-up
J Power at follow-up
K Constant score at follow-up
L Union (yes/no)

Case 9. The Rushpin was placed from lateral to medial.



Solid healing after 4 months.

Discussion

Nonunion after a fracture of the clavicle has been reported in less than 2% of patients who were treated with conventional closed techniques (Boehme et al. 1991). Painless nonunion rarely requires treatment, unless neurovascular symptoms are present. Pain or neurovascular damage usually require surgery (Boyer and Axelrod 1997). Compression plating, bone grafting and early mobilization have been successful in several small series: Jupiter and Leffert (1987) reported 17/19 healed nonunions, Bradbury et al. (1996) 31/32, Eskola et al. (1986) 20/22, Manske and Szabo (1985) 10/10 and Sanderhoff Olsen et al. (1995) 15/16.

We found comparably good function after Rushpin fixation and autogenous bone grafting, with only 1 failure in 14 patients. This patient had no healing of an atrophic nonunion after 6 months. She had a low Constant shoulder score, but refused further treatment.

Our method with the intramedullary Rushpin is better than the plate fixation technique: less tissue dissection and periostal stripping is necessary and the Rushpin can easily be removed by using local anesthesia, which was performed in 3 patients.

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