Acta orthop. scand. 45, 82–88, 1974

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PSEUDARTHROSIS IN THE SCAPHOID BONE TREATED BY GRAFTING WITH AUTOGENOUS BONE-PEG

A Follow-up Study

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Accepted 4.vi.73

Discussions regarding the best method of operative treatment for pseudarthrosis in the scaphoid bone have continued over many years and different methods have been tried. The methods of choice nowadays seem to be transplantation of cancellous bone and chips, introduced by Matti & Russe (Mulder 1968, Dooley 1968) or screw osteosynthesis combined with bone chips (Vorrhoeve 1970). Palmer introduced a method earlier described by Adams & Leonard in 1928 and Murray in 1946 to Södersjukhuset at the end of the nineteen-forties. The method involves drilling of the scaphoid bone from a radial approach and transplantation of an autogenous bone-peg through the pseudarthrosis. The bone-peg was usually taken from the tibial crest but in some cases from the ulna or fibula. Palmer & Widen published the results in 1955 and the study showed a 100 per cent frequency of union. In the following article we give the results of all patients treated with this technique at Södersjukhuset, Surgical Department I. A similar follow-up of 11 patients has recently been published by Agner & Andersen (1970). In that study five showed union but no correlation was found between x-ray proven union and the functional result. The present study will give a survey of the frequency of union after the above-described operation and the functional results and secondary osteoarthrosis. The patient group which could not be followed up was analysed from the records.

MATERIAL

Between 1947 and 1971, 58 patients were operated on for delayed union or non-union of scaphoid fractures. Six patients had died, two were reported missing and a further five persons were unable to take part in the follow-up. The material consists of 46 cases of pseudarthrosis of the scaphoid bone, eight fractures with delayed union and four recent fractures.

50 persons were grafted with an autogenous bone-peg, and of these, 41 were followed up with clinical and x-ray examinations and a further four could be judged as truly united according to the last x-ray film in the records, without a new examination.

The information (before and after the operation), which we could collect, was limited, because the journals usually did not include the out-patient department records and these were only kept for five years. The x-ray pictures for this period have not been kept in the archives. We have not been able to compare the degree of arthrosis and the types of fractures before operation with the results of the follow-up. Three surgeons performed most of the operations by the same method and there is no real difference in the frequency of union between the various surgeons. Most of the patients had a plaster fixation according to Böhler and during the last 5–6 years according to Verdan. The injuries were approximately equally divided between the right and left sides.

METHOD

The follow-up study was done in October 1972 and included clinical and x-ray examinations. Some patients, who had moved to another part of Sweden, were contacted and x-rays were taken in some of these cases. Two persons were examined within two years after operation, nine between 2–10 years and 30 after more than 10 years.

We recorded the range of movement of the wrist in the four main directions, and strength was measured with a dynamometer. The mobility was considered normal when the patient himself thought that he had normal mobility. The grading in functional groups is showed in Table 1.

Table 1. The definition of moderately and severely decreased mobility. The mobility is considered normal when the mobility is better than the highest figure in the table.

Mobility	Moderately decreased	Severely decreased
Dorsal	30–50°	0–30°
Palmar	40–65°	0–40°
Ulnar	10–25°	0–10°
Radial	5–15°	0– 5°

The follow-up x-rays performed with conventional techniques gave information of union or non-union. Pseudarthrosis is established when the x-ray films show a fracture with well-defined margins, relatively smooth surfaces and sclerosis. Furthermore the degree of arthrosis in the radiocarpal joint was classified into three groups independently of the clinical judgement. The osteoarthrosis has been divided into three stages: 1. little or no arthrosis, 2. moderate arthrosis and 3. severe

arthrosis. The first group consists of cases without visible alterations and cases where the cartilage has been found to be two mm or more and where only small osteophytes have been seen. The second group with moderate arthrosis consists of cases with a cartilage thickness less than two mm, where the osteophytes have been moderately developed and where small subchondral sclerosis or cystic rarefications have been seen. Severe arthrosis includes complete obliteration of joint space with large osteophytes and with large sclerotic and cystic areas.

RESULTS

In 32 of the 45 grafted patients union was obtained but seven of these were not given an x-ray examination at the follow-up study. True union was recorded in earlier x-rays in these cases. The 32 persons with union could be divided into 25 with established pseudarthrosis of the scaphoid bone, six with delayed union and one with a recent fracture. A total of 28 praticipated in the follow-up study. Six often experienced pain and other types of troubles but 80 per cent had no discomfort (Table 2). Eleven had little or no arthrosis according to the x-ray, thirteen had moderate arthrosis and one patient had severe arthrosis.

Table 2. The distribution of mobility, pain and discomfort in the two groups of union and non-union.

		Union	Non-union
Mobility	Normal	10	5
	Moderately decreased	17	7
	Severely decreased	1	1
Strength	Normal	23	8
	Decreased	5	5
Pain and discomfort	No	22	8
	Yes	6	5

Thirteen persons still have pseudarthrosis. Of these, eleven had pseudarthrosis, one delayed union and one a recent fracture of the scaphoid bone. Five patients had often experienced pain and trouble (including one case of secondary arthrodesis). In this group the frequency of subjective troubles was twice as high but 60 per cent had no symptoms (Table 2). Osteoarthrosis was more pronounced in this group; two had little arthrosis, nine moderate, one did not have

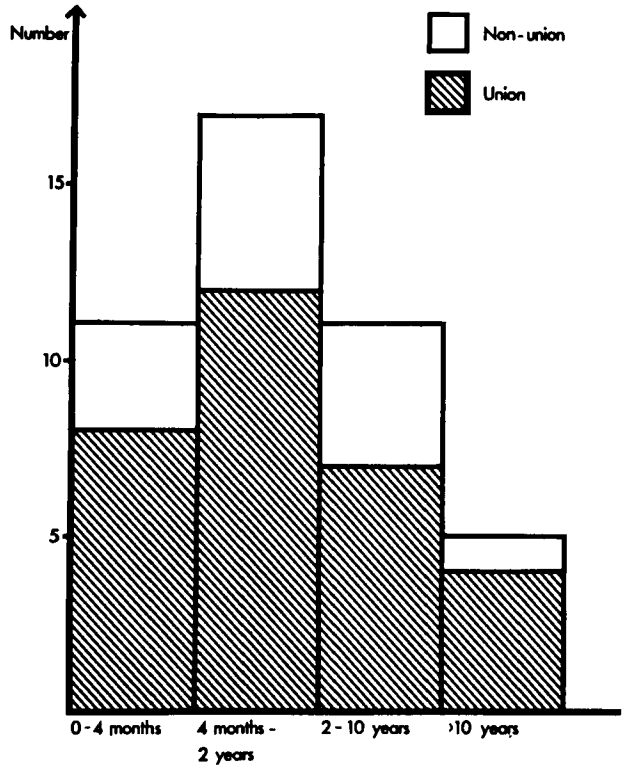

Figure 1. The number of united and non-united fractures of the scaphoid bone related to the interval between fracture and operation. (One patient has no information about trauma).

an X-ray and one was operated on later for arthrodesis of the wrist. In both groups there are many patients with decreased mobility of the wrist. The difference between the two groups is small and five persons have normal mobility in spite of persisting pseudarthrosis (Table 2).

The frequency of union is probably not related to the interval between fracture and operation (Figure 1). Perhaps there is a preponderance of pseudarthroses in the group with an interval of 2–10 years between fracture and operation. However, the age at operation seems to be an important factor for union or non-union. Under 40 years of age there is a 75 per cent frequency of union and over 40 years of age it is 55 per cent (Figure 2).

There is an interesting group of five persons, who in 1955 in the

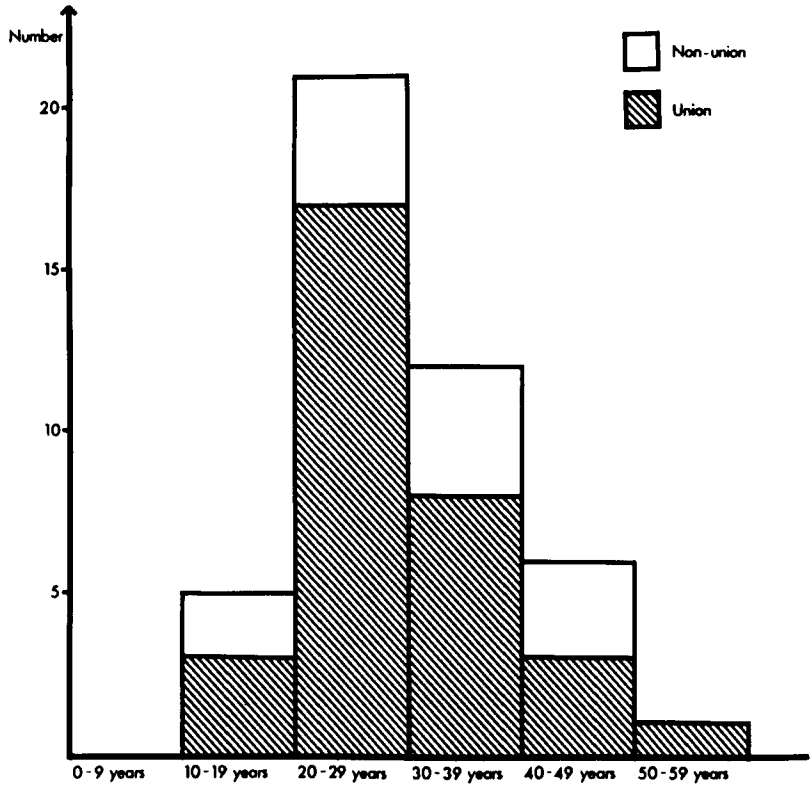

Figure 2. The number of united and non-united fractures of the scaphoid bone related to the age of the patient at operation.

earlier follow-up investigation were considered united and these results were recorded. At this follow-up they show persisting non-union. The patients had had increasing signs of union and no pain after 4–12 months. They had an average age at operation of 33 years and an interval between fracture and operation of two years (41 days–4 years). They were examined and now had slight trouble; one had slight arthrosis and the rest moderate arthrosis. A long-range follow-up investigation seems necessary in order to obtain the true frequency of union.

All patients in the follow-up study were asked about decreased sensitivity and numbness in the thumb in order to diagnose injuries of one of the small cutaneous branches from the radial nerve. In six cases we found a total or partial nerve damage.

The different forms of osteoarthrosis are shown in Table 3. There is a slight tendency to more developed arthrosis in the non-union group together with decreased mobility.

Table 3. The mobility of the wrist in the different groups of osteoarthrosis.

Mobility	Arthrosis	None or little	Moderate	Severe
Normal	Union	5	2	0
	Non-union	0	4	0
Moderately decreased	Union	6	10	1
	Non-union	2	5	0
Severely decreased	Union	0	1	0
	Non-union	0	0	0

CONCLUSIONS

The operative treatment of pseudarthrosis of the scaphoid bone involves great difficulties. Earlier works on the subject have shown the limitations of this method in achieving union and good results in patients with this condition. This investigation confirms that. It is therefore important not to neglect the primary management of wrist trauma as regards diagnosis, fixation and control in order to avoid pseudarthrosis. Wrist-sprains with primarily negative x-ray films should be rechecked after about a two-week interval with a new x-ray examination. Fractures of the scaphoid bone should be fixed with plaster according to Verdan and the patient checked until x-rays show union.

SUMMARY

Between 1947 and 1971 at the Surgical Department I, Södersjukhuset, 58 patients were operated on with some type of procedure for the scaphoid bone. 50 of these were grafted with an autogenous bone-peg through a radial approach in the fossa Tabatière. Of these, 45 were examined for union and 41 took part in a follow-up investigation. 32 were found to be united but 13 still have a pseudarthrosis. We have found that the most important factor for union is the age of the patient; the younger the patient, the higher the frequency of union. In the two groups there is rather strong tendency to osteoarthrosis in the radiocarpal joint

and moderately decreased mobility. In the pseudarthrosis group, however, there are some patients with little discomfort and essentially normal mobility and in the united group some patients with severe arthrosis and discomfort. This investigation confirms the limitations of this method in achieving union in patients with pseudarthrosis of the scaphoid bone.

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