

Intra­carpal arthrodesis or proximal row carpectomy in SNAC and SLAC wrist

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Abstract- Objective: To clarify the indications for the choice of operative intervention in patients with SLAC and SNAC wrist and to compare the functional results after proximal carpectomy (PRC) and partial intra­carpal arthrodesis with scaphoid excision.

Methods: A total of 20 patients underwent four corner fusion intra­carpal arthrodesis with scaphoid excision, and 8 patients underwent proximal carpectomy in the period from 2016 to 2023. The mean postoperative follow-up period for patients with intra­carpal arthrodesis was 3.2 years and for patients with proximal carpectomy was 3.5 years.

Results: Regarding range of motion of the wrist in the flexion-extension axis, the proximal carpectomy patients in our series showed better results than the intra­carpal arthrodesis patients, an average of 84% in the PRC patients and 75% in the intra­carpal arthrodesis patients relative to the contralateral limb. In the patients with intra­carpal arthrodesis, however, we recorded a greater preserved range of motion in the radial-ulnar deviation axis of the wrist. Grip strength was measured at 6 months postoperatively and averaged 72% for the PRC group compared with 83% for patients with intra­carpal arthrodesis to the contralateral limb.

Conclusion: Both proximal carpectomy and intra­carpal arthrodesis are surgical interventions that achieve similar functional outcomes for the treatment of degenerative conditions of the wrist (SLAC/SNAC).

Key words: post-traumatic wrist arthritis, proximal row carpectomy, intra­carpal arthrodesis

1. Introduction

Advanced wrist collapse after scaphoid ligament injuries (SLAC) and advanced collapse after scaphoid nonunion fractures (SNAC) are two of the most common causes of posttraumatic arthritis of the wrist. In both cases, the sequence of wrist degeneration begins at the articulation of the scaphoid with the styloid of the radius, progresses to the entire radioscaphoid joint, and ultimately involves the lunate-capitate joint. According to Watson and Ballet¹, "the radiolunate joint is almost never involved in the process

of posttraumatic arthritis" and they recommend excision of the scaphoid and intra-carpal arthrodesis.

Other authors recommend performing a proximal row carpectomy^{2,3} provided that the articular cartilage of the capitate head and the lunate facet of the radius are preserved from posttraumatic arthritis.

The purpose of this article is to clarify the indications for performing each of these two operative techniques in patients with SLAC and SNAC wrists and to compare functional outcomes after proximal carpectomy and partial intra-carpal arthrodesis with scaphoid excision.

In this article, based on our mid-term postoperative results, we present our own views and preferences for the choice of technique for surgical treatment of degenerative post-traumatic wrist (SLAC or SNAC).

2. Method

All observed patients in our series were operated on in the Hand Surgery and Reconstructive Surgery Clinic by two hand surgeons.

A total of 20 patients underwent four corner fusion intra-carpal arthrodesis with scaphoid excision and 8 patients underwent proximal row carpectomy between 2016 and 2023. The mean postoperative follow-up period for patients with intra-carpal arthrodesis was 3.2 years and for patients with proximal carpectomy 3.5 years.

The main parameters studied are the presence or absence of pain in the wrist during active movements and at rest. Pre and postoperative wrist range of motion (flexion-extension and radial-ulnar deviation) was measured, as was grip strength postoperatively as a percentage of the contralateral side. Control radiographs were performed preoperative (fig.1, fig.2) and postoperatively in all patients.



Fig.1 Pre-op X-ray of a SNAC wrist of 37 years old patient



Fig.2 Pre-op X-ray of a SLAC wrist of 52 years old patient

In consideration of the clinical results, additional factors were considered, such as: smoking, performed denervation of the wrist joint (neurotomy of n.interosseus posterior and n.interosseus anterior).

The type and number of complications from the two types of operative interventions in our series were also examined.

3. Results

The mean follow-up period was 3.5 years in the proximal carpectomy group and 3.2 years in the intracarpal arthrodesis group. The mean age of the patients in the proximal carpectomy series was 53 years, while the mean age of the patients who underwent intracarpal arthrodesis was 38 years.

When examining the clinical results in all patients included in both series, there was a significant improvement in pain symptomatology postoperatively compared to the available preoperative one. Regarding range of motion of the wrist in the flexion-extension axis, the proximal carpectomy patients in our series showed better results than the intracarpal arthrodesis patients, an average of 84% in the PRC patients and 75% in the intracarpal arthrodesis patients compared to the contralateral limb. In the patients with intracarpal arthrodesis, however, we recorded a greater preserved range of motion in the radial-ulnar deviation axis of the wrist. Grip strength was measured at 6 months postoperatively and averaged 72% for the PRC group compared with 83% for patients with intracarpal arthrodesis to the contralateral limb.

Postoperative radiographs were analyzed at a follow-up of 3.5 years in the proximal carpectomy group (fig. 4) and 3.2 years in the intracarpal arthrodesis group (fig. 3), with the proximal carpectomy patients showing significantly worse radiographic signs

with development of wrist arthrosis but no this is clinically apparent and relevant. None of the patients who underwent proximal row carpectomy or intracarpal arthrodesis during the follow-up period underwent wrist arthrodesis or other secondary surgery.

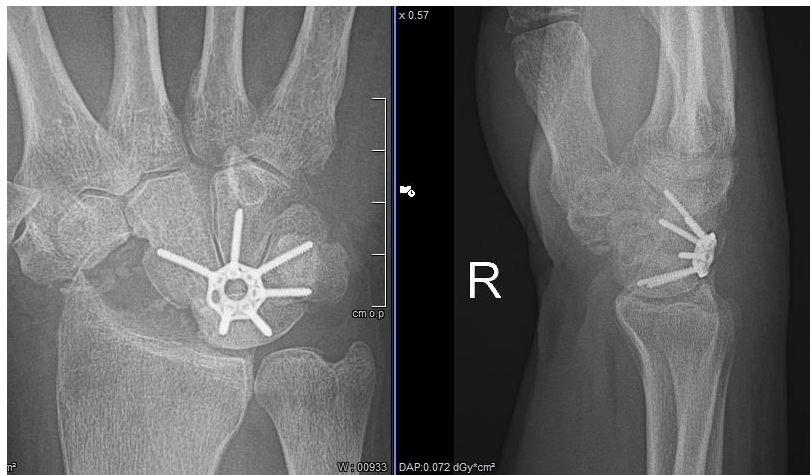


Fig. 3 X-ray 3 years post-op intracarpal arthrodesis with circular "Ring plate"



Fig.4 X-ray 2 years post-op after proximal row carpectomy

Regarding the complication rate in the series, in the proximal carpectomy patients, we observed one patient with transient tenosynovitis 2 years postoperatively. Among

the intracarpal arthrodesis patients, we observed four patients with dorsal impingement of the implant to the dorsal edge of the radius and another four patients with delayed union of the intracarpal arthrodesis, necessitating a longer period of immobilization and rehabilitation, respectively. However, all four patients had union between the carpal bones at 3 months postoperatively, which did not require further operative interventions, and their clinical results were not significantly different in the long term from the others in this series. Regarding the union of the intracarpal arthrodesis achieved by circular plate, we observed that every one of the patients in whom we used cancellous bone from the crista iliaca for auto-steoplasty did not record delayed bone union.

4. Discussion

Overall, we can conclude that the results are relatively favorable for both operative interventions in terms of pain relief and patient satisfaction. There are some differences, however, in wrist range of motion, grip strength, and postoperative complications. Studies involving intracarpal arthrodesis performed using various operative techniques have shown that at up to 10-year follow-up there is a satisfactory union rate and good functional results in terms of wrist range of motion. Also, the rate of postoperative complications and that of revisions to total wrist arthrodesis is low^{4,5}. However, there is evidence of more frequent complications with fixation of the carpal bones with a circular plate (flower plate), including nonunion of the intracarpal arthrodesis, delayed union and dorsal impingement⁶. It is reported that the most common location of pseudoarthrosis after intracarpal arthrodesis (four corner fusion) is between the os hamatum and os triquetrum due to insufficient debridement of the articular surfaces between them^{7,8}. Studies in patients undergoing proximal carpectomy have shown similar favorable outcomes with satisfactory wrist range of motion, grip strength, and pain relief achieved at 10 to 29 years postoperative follow-up^{9,10,11}. In general, the literature lacks data on severe complications after the two operative interventions, and most of them are observed after intracarpal arthrodesis (four corner fusion) - impingement, delayed union.

Similar to previous studies, we report a greater range of motion in the wrist after proximal row carpectomy along the flexion-extension line. However, postoperative range of motion in the radial-ulnar deviation axis was greater after intracarpal arthrodesis. This may be relevant for those patients whose occupation and daily life require maximal radial deviation of the wrist. Grip strength postoperatively, as a percentage of the contralateral side after intracarpal arthrodesis, was greater than that after proximal carpectomy.

In deciding which of the two operative interventions to choose, it is worth paying more attention to factors other than the non-significant small differences in postoperative wrist range of motion and differences in grip strength compared to the contralateral arm.

These factors include the rate of postoperative complications, which is at a lower percentage in the carpal carpectomy group, the results of the DASH score, which trended toward improved function in the carpal carpectomy group in patients over 45

years old¹², and perceptions and the experience of the surgeon regarding the complexity of the operative intervention and the duration of rehabilitation.

What we observed in our series was significantly greater grip strength as a percentage of the contralateral side after intra-carpal arthrodesis.

Based on the analysis thus made, we can come to the conclusion that both presented techniques satisfy the needs of the patient. However, before making a final choice of operative intervention, we focus mainly on two aspects: clinical (the patient's desire for a greater range of motion in the wrist or a greater percentage of grip strength) and instrumental studies (X-ray, MRI, CT) in order to determine which articular surfaces are preserved by post-traumatic arthritis. For example, patients in whom the articular surface of the capitate head is not intact are not good candidates for proximal row carpectomy. On the other hand, patients who desire a shorter postoperative recovery and rehabilitation period, and who do not wish to follow the postoperative protocol of intra-carpal arthrodesis, are more suitable candidates for proximal row carpectomy.

5. Conclusion

Both proximal carpectomy and intra-carpal arthrodesis are surgical interventions that achieve similar functional outcomes for treating degenerative conditions of the wrist (SLAC/SNAC). The leading indications for choosing a surgical technique should be based on several parameters, such as the patient's age, profession, the patient's preferences for the duration of the rehabilitation process, the risk of pseudarthrosis (in smokers), the possibility of debricolage of the osteosynthesis material (in patients with severe physical work) and last but not least the experience of the surgical team.

6. References

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