

Arthroscopy in scaphoid nonunions, management and outcomes of 26 consecutive cases.

Intro

Arthroscopic surgeries for scaphoid nonunions have already been reported with good to excellent results. In this series, we report our experience in management of our first 26 cases.

Methods

Over a period of four year, 26 scaphoid nonunions were operated on with arthroscopy.

All patients had wrist complaints (Mayo Wrist Score 55 (30-80)) and 4 have been previously operated on for a recent fracture. All patients had an arthro-CT-scan before surgery.

Exclusion criteria were :

- SNAC wrist type II or higher (SNAC type I were included)
- presence of screws in the scaphoid, due to the difficulty of removing screws with arthroscopy
- past history of failed nonunion surgeries, these cases were treated with vascularised graft

The grafting was performed with:

- an artificial graft of bone inducing protein in 8 cases (n=26). This protein was an eptotermine alpha bone morphogenetic protein (BMP) injected into the nonunion site through a 18 gauge needle before the fixation. It concerned the first 8 cases, then, the BMP drug was withdraw from the market.
- a bone graft from the distal radius in 18 cases (n=26). In 11/18 cases, the bone graft was harvested under endoscopy using a bone biopsy kit (cf second abstract)

The fixation was performed with :

- two compression screws in 17 cases, cannulated (Ø 2 mm) compression screws (distal to proximal in 14 cases)
- 2 k-wires with transient scapholunate fixation in 9 cases (proximal nonunions)

Five patients had an associated procedure combined with the nonunion arthroscopy: 3 partial styloidectomy due to distal radio-scaphoid arthritis (SNAC type 1), one scapholunate suture, one TFCC repair.

We used a 1,9mm in 22 cases and a 2,7mm arthroscope in 4 cases, fluid pump pressure in all cases.

A splint was kept for 4 to 8 weeks followed by physiotherapy.

Physical examinations and X-rays were performed after 3 and 6 weeks then CT-scan after 6 months in all cases.

Analysis criteria were:

- peroperative: duration of surgery
- postoperative: pain, wrist motion (F/E° ; Inclinations ; P/S°), grasp strength, Mayo Wrist Score, time off work and sports, radiographic analysis (reduction, CT-scan consolidation, secondary displacement).

Results

All patients were reviewed after 6 months. Duration of surgery was 50 minutes (35-90).

About strength and mobility:

Before surgery : F/E: 50/60°, I°R/I°C 5°/15°, P/S 75°/80°, Grasp 40% ; MWS 55 (30-80)

After 6 months: F/E: 65/65°, I°R/I°C 8°/20°, P/S 75°/80°, Grasp 85%, MWS 85 (50-95)

Concerning the scaphoid consolidation: consolidation has been achieved in 22 cases (n=26).

n=26	BEFORE mean-score	AFTER mean-score at 6 months
MOTION		
Flexion	50	65
Extension	60	65
Radial Inclination	5	8
Ulnar Inclination	15	20
STRENGTH	40%	85%
MAYO WRIST SCORE	55 (30-80)	85 (50-95)
CONSOLIDATION	-	22/26

Concerning failures, it concerned 2 waist nonunions treated with BMP, on waist nonunion treated with bone graft and screws and one very proximal nonunions treated with graft and k-wires.

Time off work was 9 weeks (1-22).

Discussion

The consolidation rate was 85% in our series and it was possible to improve patient conditions in 24/26 cases (92%).

We observed that 3 of our failures were due to insufficiency of grating or inadequate fixation. So, we consider this failure rate should be improved with our learning curve.

The main post-op improvement concerned the extension and grasp strength but many patients (18/26) kept a slight pain in forced extension despite good consolidation.

Conclusion

It was possible to treat successfully scaphoid nonunions with bone inducing protein (without bone graft) in 6/8 cases. This drug has been removed and forced us to perform endoscopic graft harvesting from the distal radius. We were satisfied with this procedure of endoscopic harvesting and we obtained good results.

The majority of our failures were achieved in the first part of our learning curve and we should increase our good results in the future by improving our surgical skill.

Endoscopic bone graft harvesting of the distal radius

Arthroscopic management of scaphoid nonunions or partial wrist arthrodesis has been described with good results. Unfortunately, the bone graft harvesting is still

performed from the iliac crest or the distal radius using an open approach. It means that the bone graft harvesting necessitates a wider approach than the intra-articular wrist surgery if performed with arthroscopy.

We developed an endoscopic procedure to perform bone graft harvesting from the distal radius and we evaluated its efficiency and morbidity in a clinical prospective series.

MATERIAL & METHOD

We developed and secured the procedure on 2 wrist cadaveric specimens.

Technique: we used a 1,9mm arthroscope with 35mmHg pump pressure, a 2mm shaver blade ; 2 dorsal portals on the same line separated from 2,5cm, located 5mm proximal to the Lister's tubercle. Under endoscopy, we performed an identification and excision of the periosteal, then we introduced a 2,3mm bone biopsy kit, 7 holes of bone harvesting were performed in the metaphyseal part of the distal radius, proximal to the Lister's.

Prospective clinical series : 16 patients were included: 11 scaphoid nonunions, 2 scaphocapitate arthrodesis (kienbock disease), 3 phalanx nonunions. The endoscopic bone harvesting was performed first then the grafting was performed second.

Evaluation: clinical examinations were performed after 1, 3 and 6 months, we evaluated the tenderness on the harvesting site, tendons or sensitive nerves damages, scare appearance using a VAS scare satisfaction score, X-ray bone healing of the harvesting and grafting site.

RESULTS

The average duration of the endoscopic bone graft harvesting was 13 minutes (8-22).

Clinical outcomes (n=16) :

-Efficiency : none tenderness was observed after 6 months ; VAS scare satisfaction score after 6 months was 9 (8-10) ; 40% of bone holes was still visible on X-ray after 6 months. All bone fixations have achieved consolidation except one former and very proximal scaphoid nonunion.

-Safety : none tendinous or sensitive skin disorders was observed.

DISCUSSION

Improvements of mini-invasive surgery for small bone non-unions have been recently achieved but the originality of our work was focus on the improvement of bone graft harvesting using an endoscopic technique.

SUMMARY POINTS

This study confirmed the feasibility and safety of an endoscopic bone graft harvesting of the distal radius.

This procedure is efficient to obtain enough cancellous bone for nonunions of the hand. It is a safe technique that can be used for intra-articular arthroscopic grafting but also for phalanx or metacarpal nonunions.

Failure analysis, failure rate 15% :

2 failures with BMP only, without bone graft : does it worth it ?

3 failures in the first 10 cases : learning curve ?

3 failures : bone graft insufficiency or inadequate fixation : learning curve ?