Mid- to Long-Term Clinical Outcomes of Total Joint Arthroplasty Using Costal Osteochondral Autograft for Finger Joint Ankylosis

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Purpose

Costal osteochondral grafting is a treatment option to restore an ankylosed or severely disordered finger joint. We first reported the clinical application of this procedure to total finger arthroplasty for MCP joint ankylosis with satisfactory results [Okuyama et al., 2009]. The number of patients who have undergone total finger arthroplasty using costal osteochondral autograft has now reached 42, with the longest follow-up being more than 11 years. Of those 42 patients, three were lost to follow-up and 23 were followed-up for at least five years. We report herein a retrospective evaluation of total finger arthroplasty using costal osteochondral autograft for ankylosed or severely disordered MCP/PIP joints with at least five years of follow-up.

Patients

Twenty-three finger joints (3 MCP joints and 20 PIP joints) in 23 patients with bony ankylosis after trauma or infection were treated with costal osteochondral autograft with at least 5-year follow up. There were 19 males and 4 females, ranging in age from 18 to 55 (mean, 33).

Surgical Technique

Ample exposure of the joint was obtained through a dorsal approach. The periosteum was elevated in concurrence with the bilateral collateral ligaments and the volar plate. After resection of the joint the phalanx (metacarpus) were step-cut for the graft floor. Two pieces of the osteochondral graft were harvested from the 5th and 6th ribs through an ipsilateral transverse submammary incision. The harvested grafts were then shaped to form a matching pair of articular surfaces of the MCP or PIP joint with adequate contour. The grafts were step-cut and stabilized using low profile screws. The finger was immobilized with a splint for a week, followed by range of motion exercises.

Methods

Clinical outcomes including range of finger motion, the Japanese Society for Surgery of the Hand version of the Disability of the Arm, Shoulder and Hand questionnaire (DASH-JSSH), donor-site disturbances, and radiographic outcomes were evaluated after a mean follow-up of 77 months (range, 60-138 months).

Results

Radiographs demonstrated complete union of the bony part of the graft to the floor in all of the patients by 8 weeks after surgery. Donor-site pain persisted only 3-4 days after surgery, and raised no particular problems. One patient injured his operated finger while playing rugby football at 2 years after surgery and diagnosed with fracture of the transplanted PIP joint. He needed additional costal osteochondral grafting. One patient injured his operated finger while playing rugby football at 2 years after surgery and diagnosed with fracture of the transplanted PIP joint. He needed additional costal osteochondral grafting. Other additional surgeries were collateral ligament reconstruction in 4, corrective osteotomy of the phalanx in 2, and tenolysis in 1.

Discussion

In this study, postoperative radiography revealed ossification of the transplanted cartilage to 3-5 years after surgery. These images might indicate subchondral remodeling of the graft with no progression of degeneration, or chondrocytes in the deep layer of the transplanted cartilage might be induced to undergo apoptosis by the changing environment.

While the reason why transplanted osteochondral grafts did not cause necrosis and why would a non-vascularized reconstructed joint from the ribs have better revascularization characteristics is still unsolved, the results of our study suggest that total finger joint arthroplasty using costal osteochondral autograft could represent a reasonable option for the treatment of ankylosis or severely disordered finger joint. One of the most characteristic advantages of this graft is that costal cartilage can be manually formed into any shape. The lack of effect on other joints is another characteristic of this graft. The only shortcoming was that careful trimming is necessary to form an anatomical joint with adequate contours.

Conclusions

Costal osteochondral autograft for finger joint ankylosis or severe articular cartilage injury demonstrated anatomical and biological reconstruction and provided stable improvement of clinical outcome with a mean follow-up of 77 months.