Original Research Article

Outcome of kienbock's disease by treatment with pronator quadratus muscle pedicle graft

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Abstract

Kienbock's disease is osteonecrosis of lunate which is difficult to diagnose and treat. In advance stage the treatment is difficult and usually these patients require wrist arthrodesis. We have used pronator quadratus muscle pedicle bone graft as treatment option to retain the mobility of the wrist joint.Ten male patients were included in the study. Wrist pain was presenting complaint. The stage of presentation was Litchman stage IIIA. All Patients were managed by Pronator quadrates muscle pedicle bone graft under Brachial plexus block with uneventful post operative period. Recovery were good in seven cases and fair in three case.Pronator quadrates muscle pedicle bone graft is good salvage procedure in advanced stage of Kienbock's disease.

Keywords: Kienbock's disease, pronator quadratus muscle pedicle bone graft.

Introduction

In 1910, Kienbock [1]described the radiological and clinical characteristics of a disease which hedescribed as lunatomalacia. The treatment of avascular necrosis of the lunate bone progressed substantially thanks to the work of Hulten, who reported in 1928 an association between the condition and the presence of a cubitus minus [2], and proposed shortening radial osteotomy as a treatment [3,4].Person subsequently introduced the concept of ulnar lengthening [5]. Since then, a large number of treatments have been proposed. Some are aimed at reducing pressure on the lunate bone, either by levelling ulna and radius at the wrist by a shortening radial osteotomy or a lengthening ulnar osteotomy, or by other techniques such as closing wedge lateral osteotomy, opening wedge lateral osteotomy or closing wedge medial osteotomy, all these techniques are based on biomechanical studies and mortality. [1] HIE is perinatal asphyxia and it long

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that support the rationale of osteotomy. Other treatments aim at addressing the actual necrosis of the lunate through autologous bone graft or vascularised bone graft [6]. This study presents a continuous series of 10 patients in stages III A and III B in whom we combined a vascularised bone graft from the index metacarpal and a lateral closing and shortening wedge osteotomy of the radius, in order to provide lunate vascularisation and to reduce pressure on the bone.

Material and methods

From 2016 to 2018, 10 patients in PMCH Patna with Kienbock's disease were treated by implantation of a vascular pedicle and bone grafting. Patients were grouped according to Lichtman's modification of the Stahl radiographic classification of Kienbock's disease. All patients were available for review had stage III A disease at the time of surgery. Patient age with an average of 35 years. All were males. The dominant hand was affected in all ten. Wrist pain was the presenting symptom in all patients and was present for an average of 18 months preoperatively. Patientshad sustained a wrist injury prior to the onset of pain. No patient had any treatment other than brief periods of immobilization prior to evaluation at our institution. All patients were available for followup at an average of two years after the procedure.Preoperative clinical

evaluation and postoperative evaluation was done by authors[7-10]. All patients responded to a questionnaire regarding symptoms, functional disability and subjective pain rating from a scale of one to ten (one being mild,infrequent pain and ten being severe, constant pain also occurring at night) preand postoperatively. Wrist range of motion was measured with a goniometer. Measurements of extension, flexion, radial and ulnar deviation were combined to describe the total are of wrist motion. Measurement of grip strength was assessed clinically. Preoperatively, all of the affected wrists were tender to direct palpation over the lunate, passive movements of wrist were painful. Standard PA, lateral, and oblique radiographs were made with the forearm in neutral rotation pre-and postoperatively. Ulnar variance was two to three millimeters negative in all patients. All patients had stage IIIA disease. None of the patient had fixed rotatory subluxation of the scaphoid. The diagnosis of Kienbock's disease was made on the basis of radiographic findings in all patients. Carpal collapse was assessed using the carpal height ratio was reduced.

Operative Procedure Lunate Revascularization Procedures:The 1979 study by Hori et al. showed that transplantation of an arteriovenous pedicle into normal land avascular bone resulted in the formation of new bone. This technique was used for Kienbock disease changes by Hori et al., Tamai et al., and Bochud and Buchler. Other sources of vascularized grafts include the distal radius based on the pronator quadrates, the pisiform as a pedicle graft, and various other grafts from the distal radius, second metacarpal, and pisiform. Sheetz et al. and Shin and bishop described the use of the fourth and fifth extensor compartment artery graft from the distal radius for revascularizing the lunate. Restoration of the lunate architecture and revasculari-zation are reported to occur in 60% to 95% of lunates treated with revascularization techniques. These procedures also are effective in relieving pain and improving function in approximately 90% of patients. Most reports reflect that the promising early radiographic changes may not persist over time, and in many patients there is further deterioration in radiographic and clinical results[11-15].

Operative technique

All patients were operated under brachial plexus block. Volar incision was used. Lunate bone was exposed and its surface was made raw. Distal 1/3rd of Pronator quadratus muscle belly was used as pedicle flap which was raised with a chunk of bone from the volar aspect of distal radius. The chunk was placed on the raw surface of the Lunate and secured in position using absorbable suture [polyglycolic acid]. Post operatively the wrist was immobilized in POP slab for a period of 4-6 weeks. After 4-6 weeks the patients were sent for physiotherapy[17-22].

Results

The results obtained were classified as good, fair or poor. A good result was defined as long term pain relief and improved function with no additional treatment needed. A fair result was one in which pain relief was achieved temporarily , but ultimately additional surgical procedures were performed. A poor result was defined as no significant pain relief or improved function as a result of the procedure. Using this classification system, there were seven good and three fair results. The paired-sample test was used to analyze the differences between pre-and postoperative patient parameters. The average change in the subjective pain rating, which decreased in all cases, was statistically significant. Although patients exhibited an increase in the total arc of wrist motion, and an increase in grip strength, the overall change in those measurements was not statistically significant. All patients were able to return to work. Patients had functional limitations that could not lift heavy weights. Radiograhic evaluation demonstrated patients shows no changes in collapse or sclerosis of lunate. No patient progressed to stage IV disease.

Discussion

The etiology of Kienbock's disease has not been definitely established, but the associated risk factors appear to be the presence of an ulnar negative wrist, repetitive stress particularly in extension and ulnar deviation, and poor lunate vascularity. Our radiographs showed that the majority of patients demonstrated an ulnar minus variant consistent with several other studies on Kienbock's disease. Diagnosis is by radiograph, bone scan and, more recently, magnetic resonance imaging. The current treatment for stage I, II and III Kienbock's disease is controversial, but many authors are now recommending leveling procedures in the majority of patients. Our study was designed to evaluate the long term follow-up of vascular pedicle implantation and bone grafting using the pronator Quadratus Muscle pedicle graft. We reported successful outcome in all patients treated by this technique with follow-up of more than 18 months. Although our patient population is small, the results seem promising enough to warrant further use of this technique. While this procedure may be particularly suited for patients with Kienbock's disease and an ulnar neutral wrist, out experience indicates that it could also be considered for patients with ulnar minus

wrists Despite the success in terms of pain relief and function in all of our patients, several questions remain unanswered. Our patients showed no worsening of the radiographic staging, but this does not mean that the lunate has been revascularized.As part of the revascularization procedure, a drill hole is placed in the lunate and the transplanted pedicle is secured with cancellous bone graft. There are no studies demonstrating the long term results of drilling and bone grafting of the lunate in the treatment of Kienbock's disease. A randomized prospective study which compares drilling and bone grafting to drilling and bone grafting plus a vascular pedicle is needed. Also the effect of denervation alone resulting from the surgical exposure is not clear. Prior published results of lunate revascularization using alternative techniques such as muscle pedicle bone grafts have been mixed. Our results appear promising enough to warrant further use of this procedure, especially on patients with IIIA Kienbock's disease that have a negative ulnar variance.

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