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RESEARCH ARTICLE

OUTCOME OF RADIUS ULNA RUSH NAILING FOR FRACTURE BOTH BONE FOREARM

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Abstract

The aim of the study was to evaluate results of closed intramedullary nailing using rush nails in adult forearm fractures. We retrospectively evaluated 34 patients with both bone forearm fractures. The average time to union was 13.2 weeks. Union was achieved in 33 out of 34 patients. Using the Grace and Eversmann rating system, 24 patients were excellent, 8 were good, and 2 had an acceptable result at a mean follow up duration of 22 weeks . One patient had non-union for the radius. There was 1 case of superficial infection, 2 Subjects had olecranon bursitis. Complication rates associated with the use of square nails were lower compared to plate osteosynthesis and locked intramedullary nails. In order to control rotation postoperatively, above elbow slab was given after nailing.

INTRODUCTION

Fractures of both bones of forearm quite common. There are various modes of internal fixations, plating or nailing[1]. Conservative treatment leads to various complications like malunion, nonunion, synostosis[2]. Plate osteosynthesis is the most commonly used techniquefor fracture fixation in adults . But, plating leads to periosteal stripping and long incision , also there is a risk of refracture after implant is removed following fracture union [3]. There are various implants like the Künt scher nail, the Rush nail, and Ender
nails which can be used for nailing[4]. In 1959, Dr. Sage used prebent triangular nailsfor the fixation of radius fractures with good results[5]. In1959, Dr. Talwarkar designed and performed fixation of bothbones of forearm fractures with flexible square nails [6].Intramedullary nailing comes with its own sets of advantagesand disadvantages. The chances of infection are significantlydecreased, as it is a closed procedure. It also has very low chances of refractureafter implant removal.The aim of this study was to assess, in adults, the result of rush nail for fracture of both bones of forearm.

MATERIALS AND METHODS

The study was conducted Utkarsh Hospital, Nadiad. The study was conducted from January 2015 to January 2012. We evaluated 34 patients (22 males and 12 females) who metthe inclusion and exclusion criteria. The inclusion criteriawere: (1) age more than 18 years; (2) patient not subjected toany other form of treatment; and (3) all open and closedfractures without neurovascular deficit.
Exclusion criteriawere: (1) skeletally immaturity; (2) Fractures older than 10 days beforetreatment;(3) presence of neurovascular deficit; (4) fractures in the proximal and distalmetaphysis; (5) patients with other injuries such asdistal radioulnar joint (DRUJ) disruption and other fractures in the same limb. All patients were followed up for a minimum of 6 months andmaximum of 3 years.

Implant Design

Rush nails were used for all patients for both radius and ulnar nailing of 2.5mm, 3.0mm, or 3.5mm nail diameter, with lengths from 20 cm to 32 cm for all surgical procedures. The ulnar nail is kept straight and radius nail was prebent approximately 2 cms proximal to the tip. The bending helps in getting anatomical curvature similar to radius curvature.

Preoperative planning

Radiographs were taken in AP and Lateral views of both bones of forearm for each patient which helped in determining the characteristics of fracture pattern and level of fracture .The size of the nails was estimated by observing the nail under C-arm at proximal and distal ends. The radius nail was taken 2 cm shorter than the ulnar nail. The diameter of the nail is estimated under C-arm on skin of patient.

Operative procedure

Under regional anaesthesia (supraclavicular block), the patient was positioned supine on the operating table with aradiolucent arm board. The shoulder was abducted and theelbow flexed 90 degree for the nailing of the ulna whereas for radius, the arm was extended and pronated while making entry into bone. Tractionwas applied to reduce the fragments. A 1cm incision atolecranon tip was made deep to the bone. Entry was made with a curved awl. The position of the awl was checked under C-arm in the anteroposteriorand lateral view. An ulnar nail of appropriate size was selected and passed intoulnar canal while maintaining traction and reduction.Nail was hammered lightly in the end to jam it in the distal end of ulna. The position was checked using the C-arm which is generally within 1 cm of the tipof ulna. The end of the nail was buried just flush to the olecranon.Changing of nail length was done before final punching. The radius was approached through dorsal surface from Lister tubercle. A 1 cm incision was made just ulnar to the Lister Tubercle on thedorsal surface and the soft tissue was divided. The 3rdextensor compartment was openedand extensor pollicis longus (EPL) was identified and retractedtoward the ulna, and the radius was identified.

Entry into the medullary canal was made with a curved awl, 2cm proximal to the articular surface under C-arm control. A radius nail of size 2 cms smaller than ulna was selected and bent at the tip.Reduction is done by traction and manipulation and rush nail is guided into proximal fragment. The position of the nail was checked under C-arm in both planes during the procedure. If there is any distraction at the fracture site while final punch and a smaller size nail was reinserted. If the reduction was difficult to achieve, an open reduction was performed. Patients were immobilized in an above elbow slab and asked to perform active finger movements. Movement of the thumb was especially checked for any injury to the EPL tendon during surgery. Slab was continued for 4 weeks and check radiograph was done. In all patients the slab was discontinued at 4 weeks and below elbow slab was given for 2 weeks. Elbow flexion extension and forearm supination pronation was started at 4 weeks.Below elbow slab was discontinued at 6 weeks and wrist range of movements were started. All patientswere prescribed physiotherapy for range of motion andstrengthening exercises.At the last assessment, the degree of forearm rotation wasmeasured with a goniometer. Functional outcome wascalculated using the system described by Grace andEversman[7]. An excellent rating meant that there was union ofthe fracture and at least 90% of normal rotation arc of theforearm. A good rating required that the fracture be united

and that a minimum of 80% of the rotatory are be present.For an acceptable result, union of the fracture and aminimum of 60% of normal rotation of the forearm werepresent. An unacceptable result meant that there was anonunion or that the patient had less than 60% of normalrotation of the forearm. Patient-rated outcome was assessedwith the Disability of the Arm Shoulder Hand questionnaire(DASH) [8,9].

RESULTS

The patients were followed up for a minimum of 6 months and maximum of 3 years postoperatively with amean follow up time of 1.6 years. The mean age of studyparticipants was 30.4 years(range, 18- 62years). The most common mode of injury was road traffic accidents 50%, followed by assault 30%, falls 20%. Spiral fracture was most common type of fracture followed by transverse andcomminuted fractures. There were two cases with openfractures, Gustillo-Anderson type II. Those weretreated with debridement of wound, primary closure and nailing. The middle one-thirdof the bone was the most common site of fractures, followed by distal one-third and the least common was distalone-third. 6patients required open reduction of the radius. All patients had an uneventful post-operative periodand union.

There was1 case with superficial infection at the radius entry site that subsided with oral antibiotics for one week.2 patients had olecranon bursitis at a follow up of 4 months which subsided once implant was removed at 1 year after time of injury. There was no loss of flexion or extension in any of thepatients as compared to the other arm. Pronation andsupination was restricted in 2 patients.

Using the rating system of Grace and Eversmann, 24 patients were excellent, 8 were good, and 2 had an acceptable result. Implant removal was performed in 10 patients at a mean of 14months post operatively and no re-fractures were reported even after an average of 6 months after implant removal

DISCUSSION

Open reduction and internal fixation with Plate is considered the gold standard for fixation of both bone forearm fractures. Several studies have shown good results [10].

Droll et al compared injured arms to uninjured arms, following internal fixation of the forearm fractures, and found that injured arms had reduced strengthof forearm pronation (70%) of that of the normal arm,
forearm supination (68%), wrist flexion (84%), wristextension (63%), and grip (75%). Also, the injuredarms had a significantly reduced active range of forearmsupination (90%), forearm pronation (91%) and wrist flexion (82%)[11]. Possible complications include compartmental syndrome [12], delayed union or nonunion [13] and re-fractures after extractionof the plate [10]. A high frequency of intraoperative nerveinjuries has also been reported [5]. The reported incidence of transient dorsal division of radial nerve palsy is 7 to 10% of all patients withradius fracture treated by plating[14]. Incidence of radio-ulnar
synostosis of the plate fixation is reported in the literature is2% to 9%[15]. Though plating for both forearm bones fracture is ideal treatment, a straight plate is leads to inability to maintain radial bow, essential for normal rotational movements of the forearm[5].

Closed nailing has advantages like, low incidence of infection, small incision and scars, less blood loss, and, relatively short operating time with minimal periosteal trauma. Anotherimportant advantage of intramedullary implants is theirstress-sharing behaviour, which causes secondary periosteal callus formation[13].

We achieved union in 33 out of 34 patients (97%) comparedto Street *et al* who reported a 93% union rate with the use ofsquare nails in forearm fixation[16]. 1 case in our series had non-union; which was bone grafted and achieved union at 3 months follow up.The cause of non-union was distraction at thefracture site.

Ozkaya *et al* conducted a study on 42 patients in which themean operation time was 65 minutes with plate-screwfixation, and 61 minutes with intramedullary nailing($p>0.05$). The mean time to union was significantly shorterwith intramedullary nailing (10 weeks vs. 14 weeks;$p<0.05$). Results according to Grace-Eversmann criteriawere excellent or good in 18 patients (81.8%) and acceptablein four patients (18.2%) treated with plate screw fixation,compared to 18 patients (90%) and two patients (10%),respectively, treated with intramedullary nailing. Mean DASH scores were 15 (range, 4- 30) and 13 (range, 3- 25),respectively. The two groups did not differ significantly withrespect to functional results and DASH scores ($p>0.05$).Postoperative complications were seen in three patients(13.6%) and two patients 10%) with plate-screw fixation andintramedullary nailing, respectively[17].

Implant removal was performed in 10 patients at mean 14 months post operatively and no re-fractures were reported even after an average of 6 months post removal which islower than those associated with plate removal[10,18].

CONCLUSION

Use of rush nail has good results in final range of movement of the patient.Complication rates are lower as compared to open reduction internal fixation with plate and locked intramedullary nails, but the above-elbow slab after nailing is the disadvantage of the procedure which leads to stiffness of joints initially which resolves gradually with time. The rushnail is a good tool for treatment considering its cost and good outcomes.

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