Chinese Journal of Traumatology 19 (2016) 217–220

Contents lists available at ScienceDirect

Chinese Journal of Traumatology

journal homepage: http://www.elsevier.com/locate/CJTEE

Original article

# Incidence and predictors of radial nerve palsy with the anterolateral brachialis splitting approach to the humeral shaft

Mohamad Gouse*, Sandeep Albert, Dan Barnabas Inja, Manasseh Nithyananth

*Department of Orthopaedics Unit 1, Christian Medical College, Vellore 632004, Tamil Nadu, India*

ARTICLE INFO

*Article history:*
Received 26 May 2015
Received in revised form
11 November 2015
Accepted 10 March 2016
Available online 18 March 2016

*Keywords:*
Radial neuropathy
Humeral fractures
Anterior approach

ABSTRACT

*Purpose:* Fractures of the humeral shaft are common and account for 3%–5% of all orthopedic injuries. This study aims to estimate the incidence of radial nerve palsy and its outcome when the anterior approach is employed and to analyze the predictive factors.

*Methods:* The study was performed in the department of orthopaedics unit of a tertiary care trauma referral center. Patients who underwent surgery for acute fractures and nonunions of humerus shaft through an anterior approach from January 2007 to December 2012 were included. We retrospectively analyzed medical records, including radiographs and discharge summaries, demographic data, surgical procedures prior to our index surgery, AO fracture type and level of fracture or nonunion, experience of the operating surgeon, time of the day when surgery was performed, and radial nerve palsy with its recovery condition. The level of humerus shaft fracture or nonunion was divided into upper third, middle third and lower third. Irrespective of prior surgeries done elsewhere, the first surgery done in our institute through an anterior approach was considered as the index surgery and subsequent surgical exposures were considered as secondary procedures.

*Results:* Of 85 patients included, 19 had preoperative radial nerve palsy. Eleven (16%) patients developed radial nerve palsy after our index procedure. Surgeons who have two or less than two years of surgical experience were 9.2 times more likely to induce radial nerve palsy ($p = 0.002$). Patients who had surgery between 8 p.m. and 8 a.m. were about 8 times more likely to have palsy ($p = 0.004$). The rest risk factor is AO type A fractures, whose incidence of radial nerve palsy was 1.3 times as compared with type B fractures ($p = 0.338$). For all the 11 patients, one was lost to follow-up and the others recovered within 6 months.

*Conclusion:* Contrary to our expectations, secondary procedures and prior multiple surgeries with failed implants and poor soft tissue were not predictive factors of postoperative deficit. From our study, we also conclude that radial nerve recovery can be reasonably expected in all patients with a postoperative palsy following the anterolateral approach.



## Introduction

The anterolateral approach and its modifications first described by Henry[1] is widely employed for exposures of the humerus for various pathological conditions and humeral shaft fractures which account for 3%–5% of all orthopaedic injuries.[2] The radial nerve, with its circuitous relationship to the humerus, is of special interest with any surgical exposure of the humeral shaft. The radial nerve is tightly bound by the lateral intermuscular septum as the nerve enters the anterior compartment and it is susceptible to injury at this level.[3] The aim of this study was to estimate the incidence and to determine the possible predictive factors for a postoperative radial nerve palsy with the anterior approach and to document its natural history.

## Materials and methods

### General data

This study, performed in the department of orthopaedics unit 1 of a tertiary care trauma referral center in South India, was

* Corresponding author.
*E-mail address:* gousemohamad@yahoo.com (M. Gouse).

Peer review under responsibility of Daping Hospital and the Research Institute of Surgery of the Third Military Medical University.

http://dx.doi.org/10.1016/j.cjtee.2016.03.002

approved by the Institutional Review Board (IRB min No-8405). Patients who underwent surgery for acute fractures and non-unions of humerus shaft through an anterior approach from January 2007 to December 2012 were included.

The inclusion criteria was all humeral shaft fractures and nonunion of the humerus shaft. Patients who had the followings were excluded: (1) fixation through posterior approach; (2) nailing for humerus; (3) intra-articular fracture; (4) tumors of humerus; (5) preoperative radial nerve palsy; (6) cervical spine injuries; (7) brachial plexus injury; (8) vasculitis and connective tissue disorder; and (9) open humerus shaft fractures. Irrespective of prior surgeries done elsewhere, the first surgery done in our institute through an anterior approach was considered as the index surgery and subsequent surgical exposures were considered as secondary procedures.

We retrospectively analyzed online medical records, patient charts, operation notes, radiographs and discharge summaries. Patient demographic data, comorbidities, associated injuries, timing of surgery, number of surgical procedures prior to the index surgery, AO fracture type and level of fracture or nonunion, indication for index surgical procedure, experience of the operating surgeon, time of the day when surgery was performed and chronology of radial nerve palsy together with its recovery were documented. We defined experience as number of years since completion of residency program. The first group had surgeons with ≤2 years of experience and the other group had >2 years experience. The patients were also divided into two groups according to the time of surgery – surgery done between 8 a.m.–8 p.m. in one group and evening 8 p.m. – 8 a.m. in the other group.

The level of humerus shaft fractures or nonunion was divided into upper third, middle third and lower third. In patients who underwent surgery for humerus shaft fractures, AO classification was employed. The indication for index surgical procedure was either an acute fracture or a nonunion. Nonunions encountered were either infected or not infected with or without implant failure. Secondary surgeries included implant removal or exchange and bone grafting procedures through an anterolateral approach. We defined postoperative radial nerve palsy as complete absence of brachioradialis contraction with wrist and finger drop with or without complete sensory deficit in the first dorsal web space. We defined recovery based on the Louisiana State University Health Sciences Center criteria, i.e. grade-5, full recovery of the brachioradialis, forearm supination and wrist extension with active finger & thumb extension at least against gravity & some resistance.[4] In patients with radial nerve palsy, the period of recovery and other

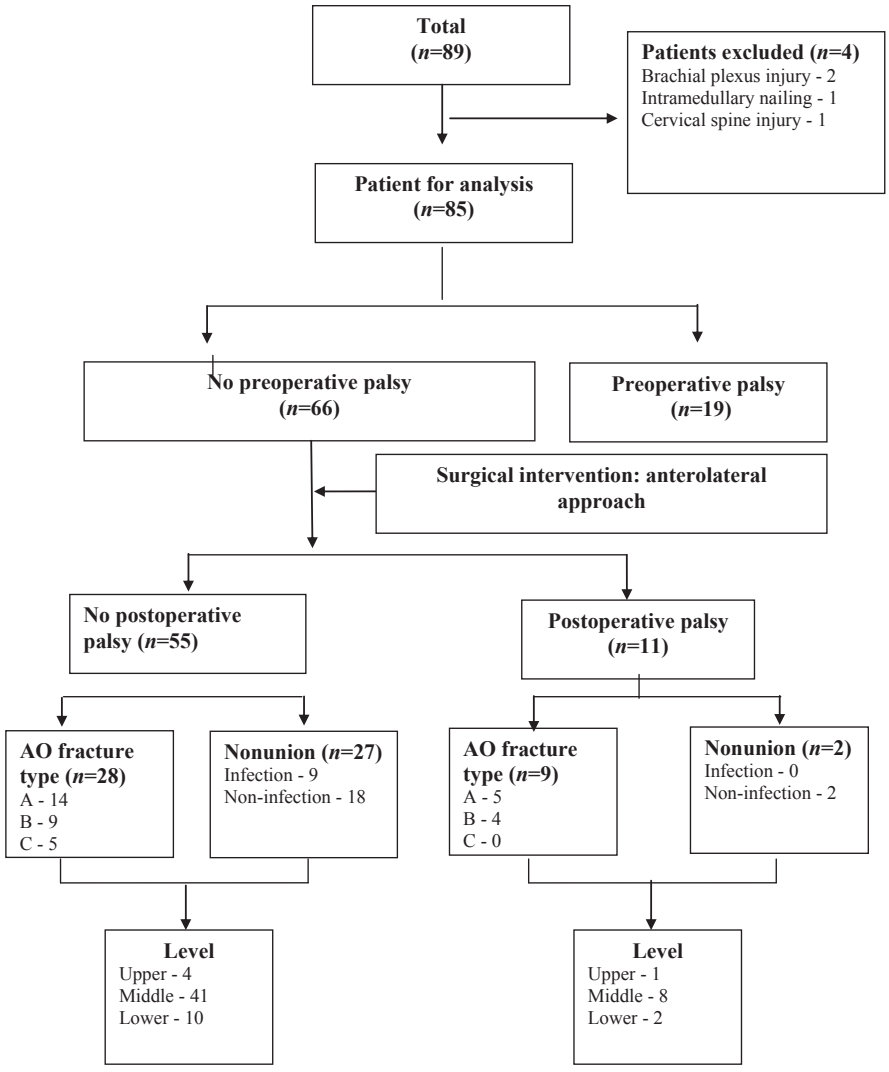


**Fig. 1.** Algorithmic representation of patient distribution in different groups.