The Professional Medical Journal
www.theprofesional.com

DOI: 10.29309/TPMJ/18.4650

ORIGINAL PROF-4650

NUTRIENT FORAMEN;
STUDY OF NUTRIENT FORAMEN IN DRIED HUMAN CLAVICLE

Anwaar Hussain[1], Jawaria Khalid[2], Abdul Rauf[3]

1. MBBS, M.Phil.
Assistant Professor
Department of Anatomy
Faisalabad Medical University
Faisalabad.
2. MBBS, FCPS
Senior Registrar
Department of Pediatrics
Children Hospital Faisalabad.
3. MBBS, DA, MCPS
Associate Professor
Department of Community Medicine
Sargodha Medical College,
Sargodha.

Correspondence Address:
Dr. Anwaar Hussain
MBBS, M.Phil.
Assistant Professor
Department of Anatomy
Faisalabad Medical University
Faisalabad.
doctoranwaarh@yhoo.com

Article received on:
13/01/2018
Accepted for publication:
10/04/2018
Received after proof reading:
00/00/2018

ABSTRACT… Objectives: To study the nutrient foramina of the dried human clavicle with respect to their position, number and direction for clinical interest. **Study Design:** Cross sectional study. **Setting:** Anatomy Department Faisalabad Medical University Faisalabad. **Period:** Six months from July to December 2017. **Material and Methods:** 60 dried human clavicles taken from bone bank of Anatomy Department Faisalabad Medical University Faisalabad. The foramina were studied according to their location, and number and direction. The foramina index was calculated using Hughes Formula by measuring the average total length and average length of foramina from sternal end of the clavicle. **Results:** The nutrient foramen was observed in all 60(100%) of the clavicle. Single foramen was present in 22 (36.6%) clavicle and double foramen in 30(50%) clavicle. Triple and quadruple foramen in 6(10%) and 2(3.3%) clavicles respectively. The 34 left clavicles posses single foramen 12 (41.1%), double foramen 14(35.2%) while triple and quadruple are 6(17.6%) and 2(5.8%) respectively. Total 26 right clavicles had 10 (38.4%) single foramen and 16(61.5%) double foramen. Total number of foramen in all 60 clavicles were 108 of which 61.1% are located on posterior surface of the clavicle, 27% were found on inferior surface and rest 11.1% were on anterior surface. The clavicle having more than one foramina are 28 out of which 64.2% was having both inferior and posterior foramina, 21.4 % was anterior and posterior while 14.28% was located on triple sites anterior, inferior and posterior. We also found 90% of foramina were present on middle 1/3 and 10% on lateral 1/3. 98.3% of the foramina were directed to acromial end while rest 1.7 % to sternal end. The mean length of foramina from sternal end is 7.46 cm and mean maximum length of the clavicle was 14.51cm. The mean foramina index was 51.41. **Conclusion:** It is concluded from the study that most of the foramina are located on middle 3rd of the clavicle the commonest site of the fractures of the bone. Most of the foramina are located on the posterior surface denoting its blood supply from the neighboring blood supply. The knowledge of the foramina and its blood supply is important for fracture healing and bone grafting.

Key word: Clavicle, Blood Supply, Foramen Index, Nutrient Foramen of Long Bone.

Article Citation: Hussain A, Khalid J, Rauf A. Nutrient foramen; study of nutrient foramen in dried human clavicle. Professional Med J 2018; 25(8):1252-1255.
DOI:10.29309/TPMJ/18.4650

INTRODUCTION

The clavicle is long short bone horizontally placed at the root of the neck. It acts as a lever to rotate the scapula.[1] It transmits weight of the upper limb to the axial skeleton.

Gross Anatomical Features

It has two ends, larger medial sternal end articulate to manubrium and 1st costal cartilage to form sternoclavicular joint and flatter acromial end which articulate with acromion to form acromioclavicular joint. The curved shaft resembles letter f, medially is convex forward in its medial 2/3 of shaft and laterally 1/3 is concave forward as retrocurve.[1] The inferior surface in its middle 2/5 has subclavius groove.

The lateral 1/5of the shaft is flattened and thus has superior and inferior surface, anterior and posterior border. The inferior surfac has rough impressions, conoid tubercle and trapezoid line for the attachment of coracoclavicular ligament. The medial 3/5th shaft is cylindrical having four surfaces, superior, inferior, anterior and posterior. The anterior surface is rough mostly but laterally smooths to form upper boundary of infraclavicular fossa. The inferior surface is having subclavius groove and on its lateral side is laterally directed

nutrient foramen.[1] The posterior surface is smooth and featureless. Lateral 2 fifth is flattened has superior and inferior surfaces. The inferior surface gives attachment to coracoclavicular ligament on conoid tubercle and trapezoid line and the ligament transmits the weight of the upper limb to clavicle.[1]

Blood Supply

Blood supply comes from three sources

a. Suprascapular
b. Thoracoacromial
c. Internal thoracic

Principal nutrient supply comes from suprascapular artery except 1/5 of the sternal end, the rest b and c supplies the periosteum.[2] Nutrient foramina directed to the acromial end following the principal" Go to the elbow and flee from the knee joint".[3]

This article is designed to study the variations in the locations, number and directions of the nutrient foramen and its surgical significance in various procedure to restore the circulation.[4] With the knowledge of variation in the nutrient foramen bone fixation and grafting can be assessed.[5]

Materials and Methods

60 clavicles were collected regardless from the bone bank of Anatomy Department of Faisalabad Medical University Faisalabad with following

Inclusion Criteria

a. Both ends preserved
b. Shaft unbroken

Exclusion Criteria

a. Irrespective of sex

Those nutrient foramina were included that give way to 26 G disposable needle. The clavicles were observed for the nutrient foramina with respect to their number, location and direction with the help of magnifying glass. The clavicles were placed anatomically on horizontal surface and measurements were carried with the help of divider and measuring foot. The length is measured from the outer most tips of both acromial and sternal ends ignoring curves of the clavicle.[3] The foramen index was calculated using Hughes formula, dividing the distance of foramen from sternal end (D) by maximum length of the bone (L) and then multiplied by 100.[6]

Foramen Index. (FI) = D x100 L

RESULTS

The nutrient foramina were observed in 60 (100%) dried clavicle. Single foramen was present in 22 (36.6%) clavicle and double foramen in 30(50%) clavicle. Triple and quadruple foramen in 6(10%) and 2(3.3%) clavicles respectively.

The 34 left clavicles posses, single foramen 12 (41.1%), double foramen 14(35.2%) while triple and quadruple are 6(17.6%) and 2(5.8%) respectively. Total 26 right clavicles had 10 (38.4%) single foramen and 16(61.5%) double foramen (Table-I).

Total number of foramen in all 60 clavicles were 108 of which 66(61.1%) are located on posterior surface of the clavicle 30 (27%) were found on inferior surface and rest 12(11.1%) were on anterior surface.

The clavicle having more than one foramina are 28 out of which18 (64.2%) was having both inferior and posterior foramina, 6(21.4 %) was anterior and posterior while 4(14.28%) were located on triple sites anterior, inferior and posterior (Table-II).

We also found 90% of foramina were present on middle 1/3 and 10% on lateral 1/3(Table-III). 98.3% of the foramina were directed to acromial end while rest 1.6 % to sternal end.

The mean length of foramina from sternal end is 7.46 cm and mean maximum length of the clavicle was 14.51cm. The mean foramina index was 51.41.

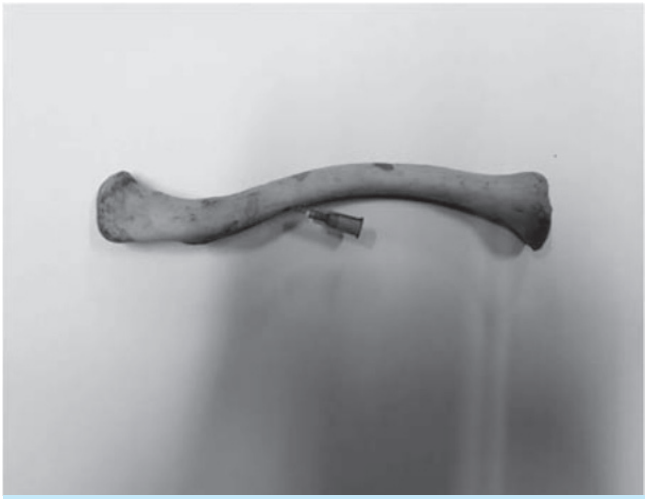

Figure-1. Nutrient foramen located on posterior surface (Left Clavicle)

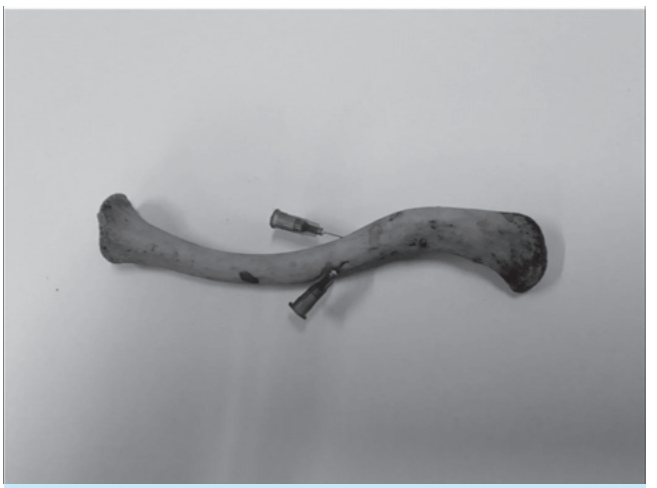

Figure-2. Double foramen on anterior and posterior surfaces (Left Clavicle)

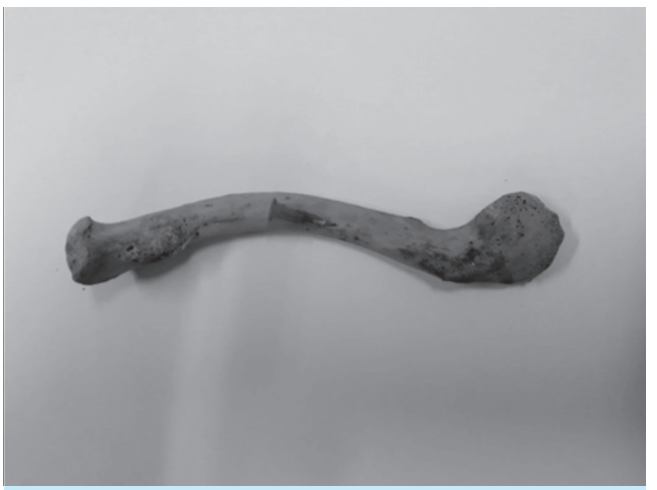

Figure-3. Foramen on the inferior surface (Left Clavicle)

Number of foramen	clavicle		
	Right (n= 26)	Left (n=34)	Total (n=60)
1	10(38.4%)	12(41.1%)	22(36.6%)
2	16(61.5%)	14(35.2%)	30(50%)
3	Nil	6(17.6%)	6(10%)
4	Nil	2(5.8%)	2(3.3%)

Table-I. Number of nutrient foramen

Surface of clavicle	Number of foramen (n=108)	More than one location (n=28 clavicles)
Anterior	12(11.1%)	Posterior & inferior 18(64.2%)
Posterior	66(60.1%)	Anterior & posterior 6(21.4%)
Inferior	30(27%)	Anterior, posterior and inferior 4(14.2%)
Total	108	28

Table-II. Location wise distribution of foramen

Parts of clavicle	Number of clavicle (n= 60)	% age distribution
Middle 1/3rd	54	90%
Lateral 1/3rd	6	10%

Table-III. Length wise location percentage of foramen

DISCUSSION

The external opening of the nutrient canal is called nutrient foramen and its position, number and location is variable in clavicles. The present study is to evaluate nutrient foramen as for its clinical reference regarding bone fracture, grafting and healing. In this study 60 clavicles were observed of which 30 clavicles has double (50%) foramina almost similar to Nita A and Vilpa A Tana[7] who observed 52% of double foramina. Knudsen et al[2] narrated surprising evidence by injecting Batons' No 17 Plastic kit in suprascapular, internal thoracic and thoracoacromial arteries of fresh cadaver that no nutrient artery was found and arterial supply was primarily periosteal. Most of the foramina 60.1% lies on the posterior surface similar to many authors. In this study 2 left clavicles (3.3%) have quadruple foramina, this evidence is not noted by any author probably may be due to using 26 G needle probing small sized foramina.

90% of the foramina were on middle third

as described many researcher including 72% foramina by Nita A Tana, Vilpa A Tana.[7] Murlimanju et al[8], noted middle 1/3 location of foramina in 92.3% of the clavicle and medial 1/3 in 9.6% clavicle contrary to my observation. 98.3% foramina are directed to acromial end the growing end of the bone but the rest 1.65% are directed to the sternal end, the later is contrary to the direction of foramen to growing end of the bone, the reason is unknown. The mean length of the foramina from sternal end was 7.46 cm and foramina index was 51.4 cm. the findings of this study were similar to those found by Nita A Tana and Vil; pa A Tana. Rai et al[9] who found the mean distance from sternal end 6.76cm and foramina index 48.01. So most of the foramina were located in the middle 3rd of the clavicle and thus the surgeon should be careful in bone fixation and grafting as it's the common site of the fracture of the clavicle.[10]

CONCLUSION

It is concluded from the study that most of the foramina are located on middle 3rd of the clavicle the commonest site of the fractures of the bone. Most of the foramina are located on the posterior surface denoting its blood supply from the neighboring blood supply. The knowledge of the foramina and its blood supply is important for fracture healing and bone grafting.

REFERENCES

1. Standring S. **Grays anatomy: The Anatomical Basis of Clinical Practice 41st edn.** UK: Elsevier publisher. (2016) pp. 799-80.
2. Knudsen FW, et al. **The arterial supply of clavicle.** Surg. Radiol. Anat. (1989) 11: 211-14.
3. Hetalben G. et al. **Nutrient foramen of the dry human clavicle and their clinical significance.** (Nov.2014). Vol.3 Issue.11, ISSN 2277-8179.
4. Mysorekar VR. **Diaphysial nutrient in human long bones.** J Anat.1967; 101(Pt 4); 813-22.
5. Vinay G. Kumar AS. **A study of nutrient foramen in long bones of upper limb.** Anatomica karnataka 2011; 5(3); 53-6.
6. Hughes H. **The factors determining the direction of the canal for the nutrient artery in the long bones of mammals and birds.** Acta, Anat. (Basel.1952; 15(3); 261-280.
7. Tana, NA, Tanna VA. **Anatomical variation in position, direction, and number of nutrient foramina in clavicles 2015.** Int. J, Med. Sci Public Health of Vol. 4 issue 3 pp. 357-359.
8. Murlimanju BV, et al **Neurovascular foramina of the human clavicle and their clinical significance 2011.** Surg. Radiol. Anat. 33(8) 679-82.
9. Rai R et al, **Morphological and topographical anatomy of nutrient foramen in human clavicles and their clinical importance 2014.** IQSR-JDMS; 13(1); 37-40.
10. **Postacchini et al Epidemiology of clavicle fractures 2002.** J Shoulder Elbow Surg. 11(5) 452.

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Anwaar Hussain	Data collection & Write up.	
2	Jawaria Khalid	Final drafting.	
3	Abdul Rauf	Matritical analysis and Proof reading.	