



ORIGINAL RESEARCH ARTICLE

PREVALENCE OF CORACOCALVICULAR JOINT IN PATIENTS VISITING RADIO-DIAGNOSIS DEPARTMENT AT COLLEGE OF MEDICAL SCIENCES, CHITWAN

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ABSTRACT

Introduction: Coracoclavicular joint (CCJ) is a true synovial joint between superior surface of coracoid process of scapula and conoid tubercle of clavicle. The radiological prevalence of CCJ in various population ranges 0.55% to 21%. The CCJ are mostly discovered incidentally and is rarely associated with any symptom. Sometimes it may present with shoulder pain, limitation of shoulder movement, upper limb paresthesia and osteoarthritis of itself or adjacent acromioclavicular joint. Hence, this study is aiming to determine the prevalence of anomalous CCJ in patient visiting department of Radio-diagnosis in College of Medical Sciences, Bharatpur, Chitwan, Nepal and to observe association of CCJ with laterality, sides and gender.

Methods: A total of 1936 digital chest x-rays films were observed for the presence of CCJ, out of which 1097 images were of male and 839 of females. Age of study population ranged from 3 to 90 years. The data obtained were analyzed using Stastical Package for Social Science version (SPSS) 16.0. The prevalence of CCJ was calculated. The cases with CCJ were further analyzed to evaluate the association of CCJ with laterality, sidedness and gender using Chi-square for one-dimensional "goodness of fit" test. Chi-square of Independence was employed to compare the various parameters (laterality and side) with genders.

Results: The prevalence of CCJ was 4.6%. CCJ was more frequently observed in male (67.42%) than female (32.57%). Unilateral occurrence of CCJ (55.06%) was slightly more than bilateral (44.94%). Gender difference was not significantly associated with laterality and sidedness of joint ($p < 0.05$). The incidence of CCJ was more in second decade of life in both male and female.

Conclusion: CCJ is not rare, hence, knowledge of presence of CCJ as an etiology of shoulder pain is essential for rational therapy and will prevent misdiagnosis.

INTRODUCTION

Scapula is connected to clavicle by acromioclavicular joint and coracoclavicular ligament, which stretches from postero-superior surface of coracoid process to conoid tubercle and trapezoid ridge on inferior surface of lateral one third of clavicle. In addition, a true synovial joint, Coracoclavicular joint (CCJ) may exist between superior surface of coracoid process of scapula and conoid tubercle of clavicle, which is enclosed by fibrous capsule, lined by synovial mem-

brane and the two articular surfaces are covered by articular cartilage.¹

The embryological basis for the existence of CCJ was described by Gegenbaur in 1898. The coracoid is connected with the clavicle by the cartilaginous procoracoid which later become fibrous and is ultimately converted into the coracoclavicular ligaments. In abnormal circumstances, the conoid tubercle grows out in a direction of coracoid process, in which case the term "coracoid tubercle" was proposed by Jaluv-

ka (1956). In response, the coracoid process forms a similar outgrowth and meets the former forming an anomalous synovial joint.¹ Gumina et al have tried to associate the CCJ to the size of the scapula and clavicle, but the outcome was disagreeing.²

The incidence of CCJ was first reported in late nineteenth century,¹ however, it is an usual anatomical feature of primates.³ Since then, various radiological, cadaveric and osteological study of anomalous CCJ has been carried out in different populations.^{4,5} Geographical variation in the prevalence of CCJ has been documented in many literature. The CCJ is more common among Asians and is rarely present in Europeans and Africans.⁶ As a rule, CCJ is asymptomatic and the anomaly is revealed only by chance. Occasionally, it may give rise to pain in the shoulder which may radiate into the arm or associated with paresthesia,⁷ which if not addressed earlier, can develop osteoarthritic changes in itself and is additionally said to be a predisposing factor for the degenerative changes of acromioclavicular and sternoclavicular joints.²

Despite the clinical importance of the CCJ, no such studies were found in Nepalese Population. We carried out this study to document the prevalence of the CCJ in Nepalese population.

METHODS

We conducted a retrospective observational study in the College of Medical Sciences, Bharatpur, Chitwan, Nepal. After obtaining clearance from Institutional Ethical Committee (Ref. No- 2019-027), we collected 2015 digital x-rays films from the data bank of Radio-diagnosis department from March to May 2019, out of which 79 were discarded in which anatomy of coracoclavicular complex was found distorted due to fracture of clavicle or area of interest was masked by artifact. The remaining 1936 images were independently studied by two authors to identify the cases with CCJ. All the selected cases were discussed with a senior radiologist for validation. The demographic data like age and sex were also noted.

The age was further categorized into nine different groups (<10 years; 10-19 years; C: 20-29 years; 30-39 years; 40-49 years; 50-59 years; 60-69 years; 70-79 years; >=80 years).

Radiological presence of CCJ has been described as a triangular bony out growth from inferior surface

of clavicle with its base directed towards its inferior surface. The lateral border of bony outgrowth forms an articular surface which articulate with a tubercle on dorsomedial surface of coracoids process forming CCJ (Fig 1-5).^{8,9}



Figure 1: Radiograph of thoracic region (PA view) of 5 year old male showing bilateral presence of CCJ (orange encircled area).

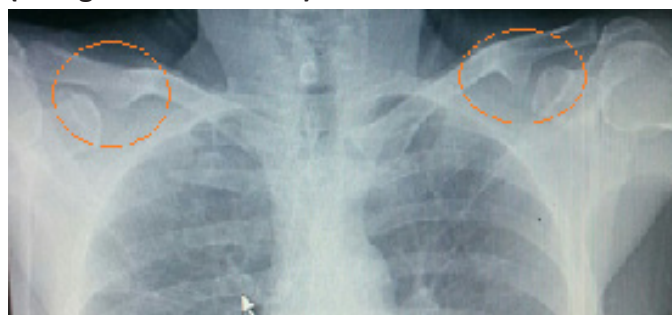


Figure 2: Radiograph of thoracic region (PA view) of 45 year old male showing bilateral presence of CCJ (orange encircled area).



Figure 3: Radiograph of thoracic region (PA view) of 59 year old female showing bilateral presence of CCJ (orange encircled area).



Figure 4: Radiograph of thoracic region (PA view) of 29 year old male showing unilateral (on right side) presence of CCJ (orange encircled area).

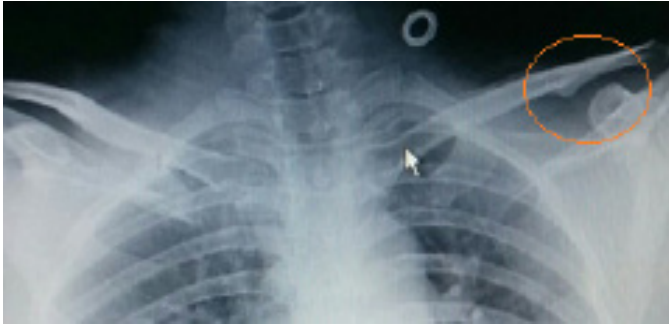


Figure 5: Radiograph of thoracic region (PA view) of 34 year old male showing unilateral (on left side) presence of CCJ (orange encircled area).

Data obtained were first entered in epidata 20.1 and was analyzed using Stastical Package for Social Science version (SPSS) 16.0. The prevalence of CCJ was calculated. Distribution of CCJ in male and female of

different age groups was calculated in those where the CCJ was present. The cases with CCJ were further evaluated for any association with laterality and gender using Chi-square for one-dimensional “goodness of fit” test. Chi-square of Independence was employed to compare the various parameters (laterality and side) with genders. A p-value <0.05 (95% confidence interval) was considered significant.

RESULTS

A total of 1936 images were observed, out of which 1097 were male and 839 were female (Table 1). Age of study population ranged from 3 to 91 years of age. CCJ was observed in 89 cases, thus, the prevalence was 4.6%.

Table 1: Gender wise distribution of laterality and sidedness of CCJ

	Male (n=1097)	Female (n=839)	Total (n=1936)
	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
Unilateral or Bilateral CCJ			
Absent	1037 (94.5%)	810 (96.5%)	1847 (95.4%)
Present	60 (5.5%)	29 (3.5%)	89 (4.6%)
Bilateral CCJ			
Absent	1072 (97.7%)	824 (98.2%)	1896 (97.9%)
Present	25 (2.3%)	15 (1.8%)	40 (2.1%)
Unilateral CCJ			
Absent	1062 (96.8%)	825 (98.3%)	1887 (97.5%)
Present	35 (3.2%)	14 (1.7%)	49 (2.5%)
Right Unilateral CCJ			
Absent	1090 (99.4%)	834 (99.4%)	1924 (99.4%)
Present	7 (0.6%)	5 (0.6%)	12 (0.6%)
Left Unilateral CCJ			
Absent	1069 (97.4%)	830 (98.9%)	1899 (98.1%)
Present	28 (2.6%)	9 (1.1%)	37 (1.9%)

The cases with CCJ were further analyzed. Age-wise distribution of CCJ in various groups was done (Table 2). It was observed that the occurrence of CCJ was more in group between 20 to 29 years of age in both male and female. The CCJ then declines as the age increases. Three CCJ were present in first decade of life. The CCJ was absent after 70 years of age in female while in male six joints were found. The CCJ was seen as early as 5 years of age (Figure 1).

Chi square test for a one dimensional “goodness of

fit” was applied to access the association between prevalence of CCJ and laterality, side and gender (Table 3). It was found that the unilateral occurrence of CCJ was more than bilateral, but the difference was not significant (p>0.05). Amongst unilateral CCJ, 37 were observed on left side and 12 on right side, the difference being statistically significant (p<0.05). While observing gender wise distribution, the joint was found to be predominant in male than female, the incidence being statistically higher in male than in female.

Table 2: Age wise distribution of CCJ in male and female

Age group	CCJ (n=89)		
	Male	Female	Total
	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
<10	2 (2.25%)	1 (1.12%)	3 (3.37%)
10-19	10 (11.24%)	1 (1.12%)	11 (12.36%)
20-29	18 (20.22%)	8 (8.99%)	26 (29.21%)
30-39	12 (13.48%)	3 (3.37%)	15 (16.85%)
40-49	4 (4.49%)	7 (7.87%)	11 (12.36%)
50-59	4 (4.49%)	7 (7.87%)	11 (12.36%)
60-69	4 (4.49%)	2 (2.25%)	6 (6.74%)
70-79	5 (5.62%)	0 (00%)	5 (5.62%)
>=80	1 (1.12%)	0 (00%)	1 (1.12%)
Total	60 (67.42%)	29 (32.58%)	89 (100%)

Table 3: Comparison of parameters (laterality, side and gender).

Parameter		Frequency (Percent)	Chi square	p-value
Laterality (n=89)	Unilateral	49 (55.06%)	0.91	0.34
	bilateral	40 (44.94%)		
Side (n=49)	Right	12 (24.49%)	12.75	0
	Left	37 (75.51%)		
Gender (n=89)	Male	60 (67.42%)	10.79	0.001
	female	29 (32.58%)		

Further, Chi-square of Independence was employed to compare the various parameters (laterality and side) with genders (Table 4). Sexual dimorphism was not found to be significantly associated with laterality and sidedness of joint.

Table 4: Association of gender with laterality and sidedness of CCJ joint.

Parameters		Male	Female	Chi square	p-value
		Frequency (Percentage)	Frequency (Percentage)		
Laterality (n=89)	Unilateral	35 (39.33%)	14 (15.73%)	0.799	0.371
	Bilateral	25 (28.09%)	15 (16.85%)		
Side (n=49)	Right	7 (14.29%)	5 (10.20%)	1.335	0.248
	Left	28 (57.14%)	9 (18.37%)		

DISCUSSION

In a present radiological study, the prevalence of CCJ was found to be 4.6% while, the other studies showed 0.55%-4.3% prevalence.^{1,3,6,10,11} The study conducted in Northwest Indians reported 10.1% prevalence of CCJ which is much higher than that of our study.¹² Few literature showed much variation (0.78%-16%) in occurrence of CCJ in osteological study.^{2,12,13} Cadaveric study showed highest (9.8%-28.26%) occurrence of CCJ compared to radiological and osteological study.^{14,15} In cadaveric study, presence of cartilaginous facet on clavicle and coracoid process supports the existence of CCJ, accounting for highest prevalence of joint.¹⁴ On the other hand, radiological presence of CCJ has been described as a triangular bony out growth from conoid tubercle on inferior surface of clavicle approaching the tubercle on dorsomedial surface coracoid process of scapula whereas, in dry bones, the presence of articular facet on conoid tubercle on inferior surface of clavicle and reciprocal facet on coracoid process of scapula indicates the presence of CCJ. Many times CCJ do not present the projection on conoid tubercle, as such, CCJ may be neglected in radiological study, and this explains the discrepancies in prevalence of CCJ in radiological and osteological study.

The current study showed that the prevalence of CCJ in male was significantly greater than in female. Similar finding was observed in the study conducted by Lewis.¹⁴ In the study conducted by Chopra, though the joint was more frequently observed in male than female but there were no significant differences.⁵ Few other studies also showed that there is no statistically significant difference between genders and

the prevalence of CCJ.^{10,13,15} The sexual dimorphism in the prevalence of CCJ is yet to be explored.

In a present study, the unilateral occurrence of CCJ was more than bilateral, but the difference was not significant ($p>0.05$). In a similar study by Chopra, prevalence of CCJ was significantly more on one side than both.⁵ On the contrary, few survey reported that bilateral occurrence of joint was more common than unilateral.^{10,11,15} Left sided CCJ was predominant in our study than right ($p<0.05$), which is in agreement with available literatures.^{5,13,16}

The CCJ was present as early as 5 years of age. None of the children had CCJ in the study conducted by Chopra.⁵ In a study by De Hass, prevalence of CCJ in the children up to 12 years of age was 1.5%,¹ while it was much lesser (0.002%) in our study. Majority of the joint was present in third and fourth decade of life in the present study and gradually declines thereafter. Conversely, the other study revealed that the age of prevalence of joint ranged between 41-60 years of age.^{2,15} Cho and Kang suggested that the CCJ is the result of aging process however, the findings of our study contradict it.¹⁵

There are lots of arguments regarding the origin of CCJ. Few studies suggested CCJ is a genetic traits,¹⁰ that does not follow a simple Mendelian pattern of inheritance,¹⁷ while other believed that the joint is acquired due to ageing¹¹ or occupational stress.¹⁸ Gumina et al performed an osteological study in 1020 dry clavicle and found that the prevalence of CCJ does not present correlation with morphometric features of articulating bones,² which is in consensus with the finding of Cho and Kang.¹⁵ On the other hand, Nalla and Asvat observed that the individual with CCJ had longer clavicles and first ribs and larger scapulae.¹³

Few surveys suggest that the CCJ are an anatomic variant which are mostly discovered incidentally and is rarely associated with any symptom. However, Singh et al reported a case of 50 year old man, a machine operator by profession, complaining chronic pain and paresthesia of both shoulder associated with bilateral CCJ.¹⁶ The symptoms are attributed to the compression of brachial plexus. Apart from anomalous CCJ, the abnormal attachment of subclavius muscle also result in compression of brachial plexus.¹⁹ The existence of CCJ also restrict rotation

of scapula leading to fracture of surgical neck of humerus.¹³ As far as the degenerative changes in acromioclavicular joint is concerned, there is debate whether the CCJ is culprit or not. Gumina et al reported degenerative changes in acromioclavicular joint in six out of seven clavicles with CCJ belonging to fourth to sixth decade of life and suggested that the arthritic changes could be due to the stiffness of acromioclavicular and sternoclavicular joints with diminished ability to absorb the stress impacted upon it.² On contrary, DePalma claimed that physical trauma and systemic disease are the predisposing factors for arthritic acromioclavicular joint and CCJ do not play any role.²⁰ Osteoarthritis of CCJ is uncommon and thought to occur due to the instability of joint over long period of time and is further aggravated when pressure is loaded on one arm as in weight lifting by ipsilateral arm.⁷

As the present study was done retrospectively on the data available in the department of Radio-diagnosis in college of medical science, Bharatpur, therefore, presence of CCJ could not be correlated with clinical history of the patient. Further, the result of the study could not be generalized to overall Nepalese population.

CONCLUSION

The prevalence of CCJ in our study cannot be considered rare. Unilateral CCJ was slightly more than bilateral. Gender difference was not significantly associated with laterality and sidedness of joint. The occurrence of CCJ was more in second decade of life in both male and female. Knowledge of presence of CCJ as an etiology of shoulder pain will undeniably help clinician to clinch the exact diagnosis and to contemplate an appropriate treatment.

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