

# Bipartite Atlas –A Rare Entity, a Study of Its Incidence in North Indians.

S Garg<sup>1</sup>, R. Agarwal<sup>2</sup>, D.Goyal<sup>3</sup>

<sup>1</sup>Associate Professor, Department of Anatomy, S.N.M.C Agra, UP.

<sup>2</sup>Associate Professor, Deptt of SPM, S.N.M.C Agra, UP.

<sup>3</sup>Orthopaedic surgeon, Deepak Hospital Agra. U.P.

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## ABSTRACT

**Background:** Combined anterior and posterior C1 bifidity i.e BIPARTITE ATLAS or SPLIT ATLAS is a rare entity. Our goal in this study was to examine the incidence of this anomaly in North India. review the literature and the clinical implications of this cleft defects.. **Methods:** It is retrospective study of NCCT evaluation in 1735 patients who underwent CECT neck[900 patients] NCCTwith spine evaluation[835patients]in Pankaj diagnostic set up between jan 2012 to December 2016, and department of radiodignosis Sarojini Naidu Medical college Agra during the time interval between dec 2016 to july 2017 the images were reviewed retrospectively to identify patients with BIPARTITE ATLAS defects. Posterior arch defects of the atlas were grouped in accordance with the classification of Currarino et al, anomalies were subsequently grouped. **Results:** We found only 4(4/1735) patients of bipartite atlas i.e .2% of total. anterior arch defects were midline and have a reported width ranging from 1-5 mm The type A posterior arch defect was found in 3 patients and the type B posterior arch defect was found in one patients. No type C, D, or E defects were observed in these bipartite atlas defect The CT scans of the patients show midline clefts of the anterior and the posterior arches of C1 with similar imaging features: smooth margins lined by cortical bone and no lateral offset. The patients had no neurological symptoms relating to the C1 abnormality, and no follow-up was performed. **Conclusion:** Bipartite atlas is a rare entity as it's incidence was found to be just .2%. knowledge is essential as it can predispose to certain neurological compressive disorders. awareness helps in clinicoradiological diagnosis, management in patient of trauma as appearance of cleft simulate Jefferson fracture.

**Keywords:** Bipartite atlas, cleft defect, Arch of C1, CT scan.

## INTRODUCTION

A split or bipartite atlas is a congenital abnormality that results in a coexisting anterior and posterior schisis due to the failure of fusion of the anterior and posterior arches (Fig. 1). This complete bipartition of the atlas has been reported in only 0.1% of the population (Hummel et al., 2013)<sup>[1]</sup>(Tachibana et al)<sup>[2]</sup>.

In cervical spine trauma, profound knowledge of congenital atlas defects is crucial. Malformations, where C1/C2 junction might be compromised, have to be distinguished from fractures. Spine Surgeries on one hand where they are helping patient in allaying their problems, on other hand

they are increasing morbidity if not properly done like C1 laminectomy procedures increases the risk of anterior arch fractures, and if this is associated with posterior arch defect it simulate bipartite atlas so knowledge of this variant of atlantal arch defect is essential' Currarino et al<sup>[3]</sup> and Geipel<sup>[4]</sup> reported the incidence of atlantal arch defects by a cervical radiographic study and a cadaveric study, respectively. Few cadaveric and imaging studies have been reported on the Bipartite Atlas anomaly detection of these anomalies is clinically important because they can cause neurologic compressive disorders and so we took this study.

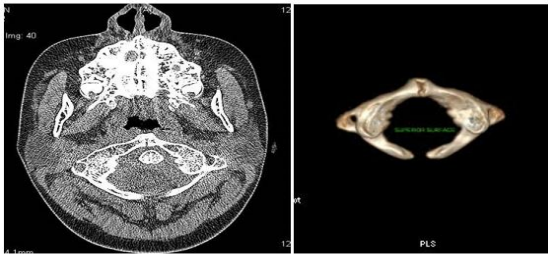
## MATERIALS AND METHODS

The records of 1735 patients who presented with various medical problems visiting a major diagnostic set up Pankaj CT Scan b/w jan 2012 to dec 2016 and in deptt of radiodignosis SNMC agra during the time interval b/w between december 2016 to july 2017 were reviewed retrospectively.

### Name & Address of Corresponding Author

Dr. R. Agarwal  
Associate Professor,  
Deptt of SPM,  
S.N.M.C Agra,  
UP.

The craniocervical computed tomography (CT) scans done in these patients were evaluated to see the cervical spine morphology.



**Figure 1: Bipartite atlas in a 12 year old boy CT a.axial view b.Three dimensional view.**

The patients clinical history had varied medical problems, including weakness, palpable neck mass, posterior neck pain, radiculopathy due to degenerative disease or after traffic accident, arm pain, sore throat. When a congenital defect of the atlas arch was identified on a CT scan, the patient's medical record was reviewed to determine his or her neurological status. An associated anomaly was searched by retrospective review of X-ray and CT findings. Exclusion criteria were incomplete visualization of the CVJ[cervicovertebral junction], radiologic evidence of traumatic lesion at CVJ, severe degeneration, previous operation, known skeletal dysplasia, and maturation delay. We evaluated consecutive neck (3 mm interval image from lower occiput to second thoracic vertebra) and cervical spine (2 mm interval image from lower occiput to second thoracic vertebra) CT scans. At our institution, CT was done on GE OPTIMA 660, 64-slice CT scanner. Imaging parameters were as follows: 2.75 mm slice thickness, 0.75 s/rotation, 120 kV, and 300 mA. Reconstruction was done with a slice thickness of 1.0 mm.

At Pankaj diagnostic set up CT machine used was GE Bright speed 16 slice, imaging parameters were 2.5mm slice thickness, 120Kv;160mA reconstruction was done with slice thickness .6 mm. Posterior arch defects of the atlas were grouped in accordance with the classification of Currarino et al.<sup>3</sup> who have divided posterior arch defects anomaly into five types (Table 1), depending on the extent of absence of the posterior arch and the presence or absence of the posterior tubercle.

**Table 1: Classification of congenital anomalies of the posterior arch of the atlas according to Currarino et al.<sup>3</sup>**

Type	Description
A	Failure of posterior midline fusion of the two hemiarches
B	Unilateral defect
C	Bilateral Defect
D	Absence of the posterior arch, with persistent posterior tubercle
E	Absence of the entire arch, including the tubercle

**Table 2: Type of posterior arch defect in bipartite atlas found, and associated anomaly present in these patients.**

Pat ient No.	Sex	Age	Type of post er ior arch def ect	Ant er ior arch def ect	Assoc iated anom aly	SYMP TOMS	DIAG NOSIS
1	M	12 yr s	A	Mid line an ter ior cleft	cleft palate	headach e, neck pain precipit ated due to somersa ults	cervical sprain
2.	F	16 yr s	A	Mid line an ter ior cleft	absen ce of pedicl e of C7	neck pain	cervical pain
3	M	35 yr s	A	Mid line an ter ior cleft	palpa ble neck mass	Rough voice	larynx cancer
4	M	39 yr s	A	Mid line an ter ior cleft	none		cervical sprain

In all cases anterior ossification center did not develop and lateral masses did not fuse anteriorly resulting in anterior cleft [Figure 3], the majority of anterior arch defects are midline and have a reported width ranging from 1-5 mm.<sup>[5]</sup>

## RESULTS

Response rate in the study was 86.957% (20/23). Among the respondents, combination of C&B with PPT was the preferred mode of teaching in 45% students whereas 35% preferred PPT over C&B. C&B was preferred only in 20% students [Table 1]

**Table 3: Student's Response Regarding Preferred Mode of Teaching**

Preferred mode of teaching	Frequency	Percentage
Chalk and board	4	20
power point	7	35
combination of both	9	45

PPT was far superior for the information content, visual enhancement, organized nature and overall delivery of the topics. Its disadvantage is dim light causes loss of eye contact, note taking is difficult, has tendency to overload information and needs electricity. Chalk and board was considered a better

tool for making the lectures understandable, for a better grasp and retention, for self-study later on resulting in better impact. But it is time consuming, one cannot go back to what has been erased and is not so effective for large no. of students.

## DISCUSSION

Efficacy of any teaching method for anatomy should be assessed under three domains – understanding the concept, retention of lecture information in memory and reproducibility of diagrams. Liking or disliking of any method by the student is dependent on the fact whether it is fulfilling their requisite or not and the prime concern of student is not only understanding the subject but also obtaining good marks in the examination. Students are directly benefitted from any teaching programme that is why they are the ones whose feedback counts.

Ability to explain i.e. make students understand a concept is an important skill of a good teacher. In addition, while learning anatomy, some facts need to be remembered as they are, as no logic is applicable to them. Even if the teacher is a very good artist, reproduction of 3- D diagrams and time constraint is a big challenge. Poor handwriting and faulty chalk and black board are other drawbacks.<sup>[13]</sup> In lectures, where only PPT was used for teaching, students reported that they faced difficulty in taking down notes and were not able to draw diagrams, not good for self-study later on. Similar reflections were given in a study by Shallcross.<sup>[14]</sup> Educational value of the class can be enhanced by proper and intelligent use of both PPT and C&B. If line diagrams are drawn by teacher on the black board and complex diagrams are shown on PPT, then the student is able to follow the hand of the teacher, keep pace with the lecture, take notes and at the same time, able to understand the complexities of the diagram. Prasad notes that ‘a good teacher with lack of audiovisual aids will be better received than the poor teacher with the best audiovisual aids. So in our set up, combination of both is preferred because C&B is student centered in reproducing the diagrams and retention of lecture information whereas PPT by way of 3-D diagrams help in understanding the subject.<sup>[5]</sup>

About 20% of the students preferred C&B alone because PPT is not good for self-study later on and student becomes a passive observer rather than an active participant.<sup>[15]</sup> PPT is overloaded with information which students find difficult to assimilate within time constraints.

## CONCLUSION

Though PPT was found suitable for the visual content and presentation style, students preferred joint use of C&B and PPT for lecture delivery. The study establishes and recommends that chalk and board should be combined with PPT in order to increase the efficacy of teaching learning process in Anatomy.

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