

**EVOLUTION OF SPEECH: A NEW HYPOTHESIS**Shishir Kumar<sup>1</sup>, Suresh Bidarkotimath<sup>2</sup>, Sanjay Kumar Revankar<sup>3</sup><sup>1</sup>Assistant Professor, Department of Anatomy, Kanachur Institute of Medical Sciences, Mangalore.<sup>2</sup>Associate Professor, Department of Anatomy, Faculty & Medicine, Jazan University, Jazan, KSA.<sup>3</sup>Assistant Professor, Department of Anatomy, A. J. Shetty Institute of Medical Sciences, Mangalore.**ABSTRACT****BACKGROUND**

The first and foremost characteristic of speech is that it is human. Speech is one characteristic feature that has evolved in humans and is by far the most powerful form of communication in the Kingdom Animalia. Today, human has established himself as an alpha species and speech and language evolution has made it possible. But how is speech possible? What anatomical changes have made us possible to speak? A sincere effort has been put in this paper to establish a possible anatomical answer to the riddle.

**METHODS**

The prototypes of the cranial skeletons of all the major classes of phylum vertebrata were studied. The materials were studied in museums of Wayanad, Karwar and Museum of Natural History, Imphal. The skeleton of mammal was studied in the Department of Anatomy, K. S. Hegde Medical Academy, Mangalore.

**RESULTS**

The curve formed in the base of the skull due to flexion of the splanchnocranium with the neurocranium holds the key to answer of how humans were able to speak.

**CONCLUSION**

Of course this may not be the only reason which participated in the evolution of speech like the brain also had to evolve and as a matter of fact the occipital lobes are more prominent in humans when compared to that of the lower mammals. Although, not the only criteria but it is one of the most important thing that has happened in the course of evolution and made us to speak. This small space at the base of the brain is the difference which made us the dominant alpha species.

**KEYWORDS**

Evolution, Speech, Human, Vertebrates, Comparative anatomy.

**HOW TO CITE THIS ARTICLE:** Kumar S, Bidarkotimath S, Revankar SK. Evolution of speech: A new hypothesis. J.Evid. Based Med. Healthc. 2016; 3(25), 1158-1161. DOI: 10.18410/jebmh/2016/265

**INTRODUCTION:** The first and foremost characteristic of speech is that it is human. Speech is one characteristic feature that has evolved in humans and is by far the most powerful form of communication in the Kingdom Animalia. Today, human has established himself as an alpha species and speech and language evolution has made it possible.

Scientists have made researches on animal behaviour and they do indicate that non-human animals, birds, and insects have some form of language, in the sense that they are capable of communicating among each other<sup>1</sup>. Experiments have been conducted on the so called lower animals to probe into their respective ways of communication. But it is unique for man to have a language with enormous varieties, enabling him to communicate with so ease and sophistication. It is therefore, said that man uses sound signals which are distinct from other animals<sup>2</sup>.

What made the man that he is today? What are the spectacular events that have made possible for him to produce between thirty to forty basic sounds or phonemes? What events in evolution from an anatomical point of view have made the speech possible? With these questions in mind we put forth our hypothesis.

**MATERIALS AND METHODS:** The prototypes of the cranial skeletons of all the major classes of phylum vertebrata were studied. The materials were studied in museums of Wayanad, Karwar and Museum of Natural History, Imphal. The skeleton of mammal was studied in the Department of Anatomy, K. S. Hegde Medical Academy, Mangalore. The prototypes of the cranial skeleton which contains the general features of the class they belong are hand sketched to explain the hypothesis.

Submission 05-02-2016, Peer Review 15-02-2016,

Acceptance 05-03-2016, Published 28-03-2016.

Corresponding Author:

Dr. Shishir Kumar,

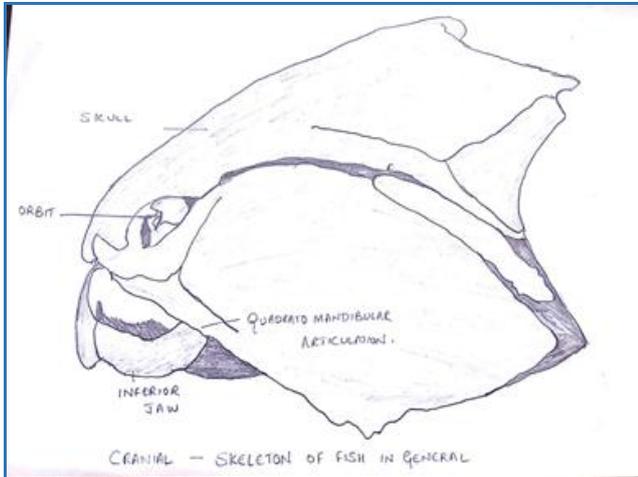
Department of Anatomy,

Kanachur Institute of Medical Sciences, Mangalore.

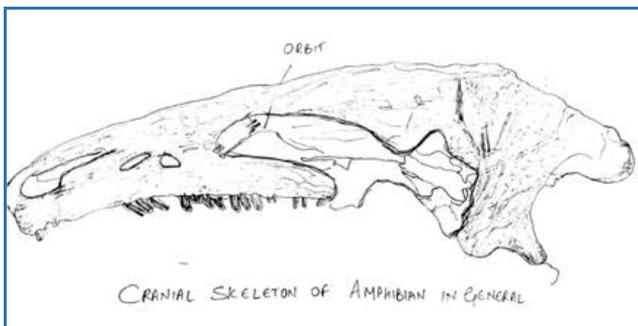
E-mail: dr.shishirnayak1986@yahoo.com

DOI: 10.18410/jebmh/2016/265

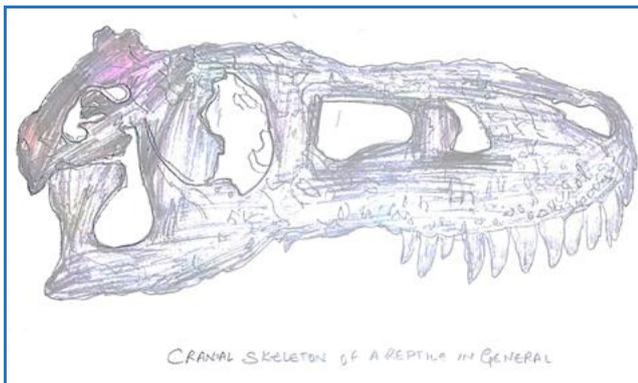
**RESULTS:**



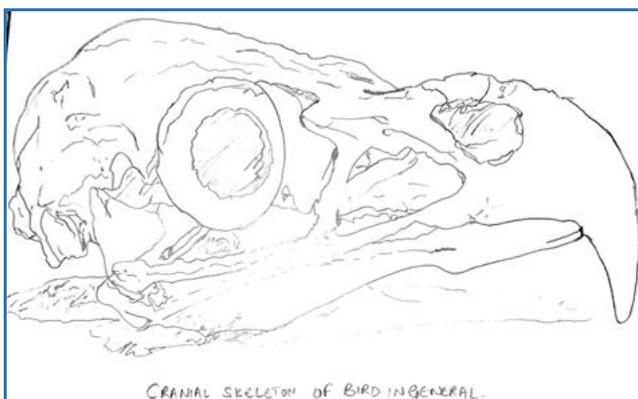
**Image 1: Cranial skeleton of fish in general**



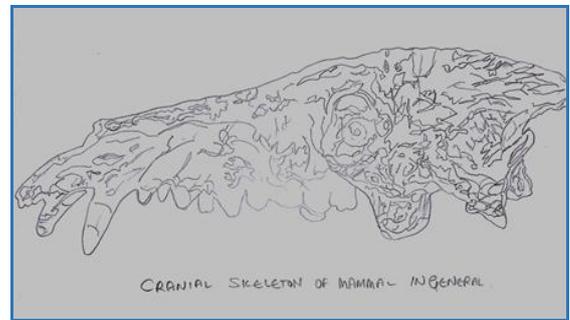
**Image 2: Cranial skeleton of amphibian in general**



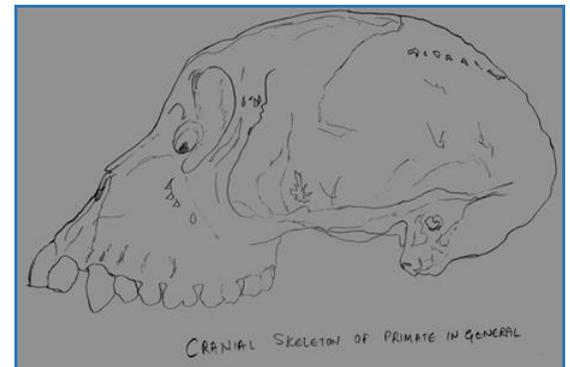
**Image 3: Cranial skeleton of reptile in general**



**Image 4: Cranium of a bird in general**



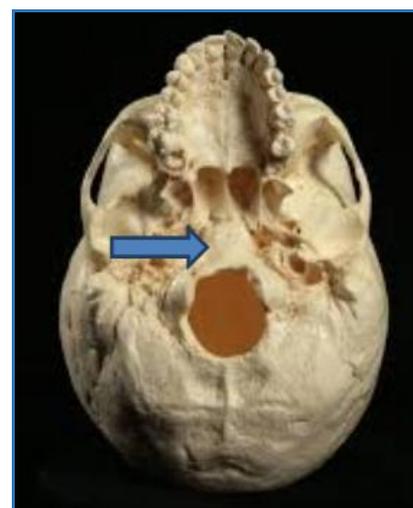
**Image 5: Cranium of a mammal in general**



**Image 6: Cranium of a primate in general**



**Image 7: Cranium of human part which is of point of interest**



**Image 8: Basal View and part which is of point of interest**

It is very clear from observing the base of the skull of animals that belong to each and every major classes of the Kingdom Animalia that there is successive formation of a deep notch at the base of the skull. The notch becomes prominent as we ascend the hierarchy.

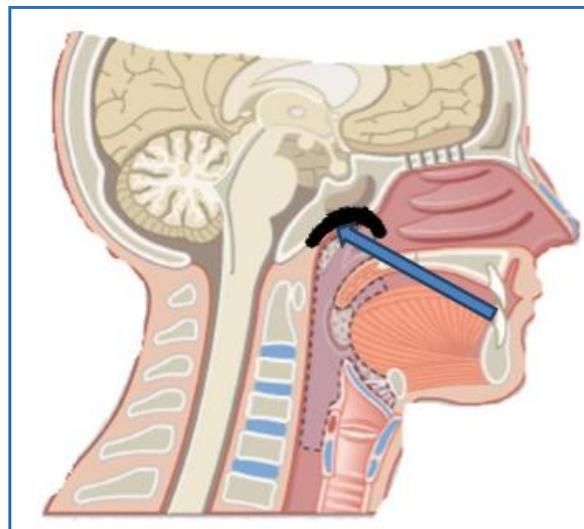
Because of pronounced flexion occurring at each and every level of classification more and more big notch was formed. The bipedal gait was the only needed spark to ignite the speech. Humans achieved the bipedal gait and it formed a perfect platform for the evolution of speech.

**DISCUSSION:** Upright or erect posture has brought about a plethora of anatomical changes in the human body<sup>3</sup>. The foramen magnum or the window through which the brain communicates with the body has been brought back towards the posterior side near the occipital bone. This adjustment is mainly made for balancing the head on the body. But this was a blessing in disguise because it made more room for the primary vocal resonator chamber.

Because of having an upright posture, the pharynx became enlarged, elongated and bent when compared to the quadrupeds, where it is suspended at the end of the spinal cord. The pharynx, is a part of the upper airway between the tongue and the larynx. It is called the oropharynx. The enlarged pharynx acted as an important resonator and this helped in the production of speech. Apart from these, dental reduction also happened. The anatomy of the jaw changed and when this was added with the dental size reduction created more room in the mouth which now acted as a secondary resonator.

More than anything else the major change that influenced in the evolution of speech is the flexion of the cranium and thus forming a deep pit in the base of the cranium. This extra space which is indicated in the image 7 and image 8 is the most important thing that has happened in evolution.

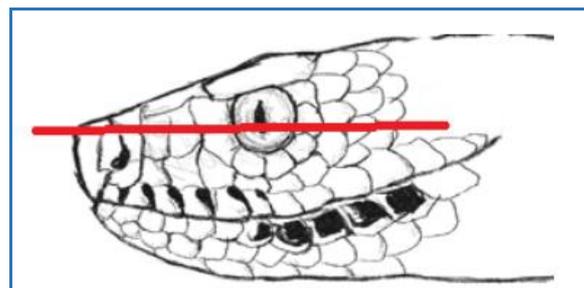
From physics, we know that long cylinders have low resonant frequencies and short cylinders have high resonant frequencies. A simple demonstration can be made by simply blowing air into 2 bottles of various lengths. The longer bottle will produce lower tone and the shorter bottle will produce higher tone. This effect is also demonstrated every time a water glass is filled. The increase in the frequency of the sound that is produced as the glass is filled occurs because the resonating cavity becomes shorter and shorter as more air is displaced by water. This simple rule will be quite useful. It can be applied directly to the differences that are observed in the acoustic properties of speech produced by men, women, and children, who have vocal tracts that are quite different in length.



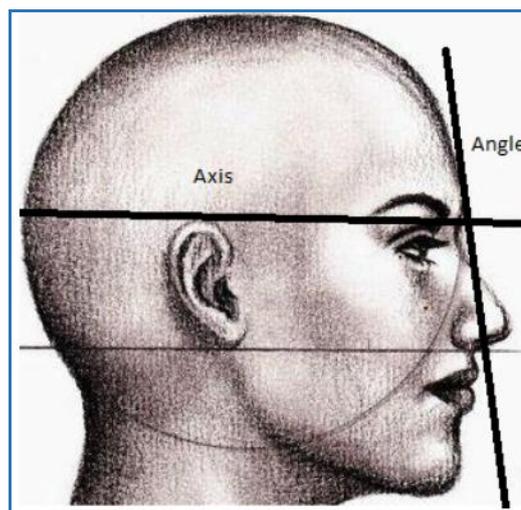
**Image 9: The extra space which is directly above the oropharynx**

The cranium can be divided into neurocranium i.e. the part of the cranium that holds the brain and the splanchnocranium or the facial bones.

In the evolutionary concepts it is always said that the size of the neurocranium is inversely proportional to that of the splanchnocranium. With this also developed the theory of flexion. If we carefully observe the lower classes like fishes, amphibians and reptiles, the nostrils or the nares are pointed towards the front.



**Image 10: Showing the direction of the nostrils and the axis**



**Image 11: Showing the angle between the axis and the nostrils (flexion)**

As the evolution occurs the splanchnocranium has flexed in relation to the neurocranium and as a result there is a deep pit formed at the base of the skull which is evident in the side profile of the human skull which is shown in the image 7 and image 9.

**CONCLUSION:** Of course this may not be the only reason which participated in the evolution of speech like the brain also had to evolve and as a matter of fact the occipital lobes are more prominent in humans when compared to that of the lower mammals. Although, not the only criteria but it is one of the most important thing that has happened in the course of evolution and made us to speak. This small space at the base of the brain is the difference which made us the dominant alpha species.

**REFERENCES:**

1. Darwin C. Descent of man and selection in relation to sex. J Murray, London 1871;vol 1:1<sup>st</sup> edition.
2. Kamal K Mishra. Text book of Anthropological Linguistics. New Delhi: concept publishing Co. 2000:16-17.
3. Dutta AK, Essentials of anatomy, superior and inferior extremities, part III, current Books international, Kolkata. Chapter - 9, 2009; 4<sup>th</sup> Edition:P-66.