MORPHOMETRICAL STUDY FOR DEVELOPMENT OF VOMER BONE IN INDIGENOUS SHEEP FETUSES

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(Received,9 January 2011,Accepted 8 February 2011)

Key Words: Vomer bone, Morphometical study, indigenous sheep fetuses.

ABSTRACT

This study included detection the onset time of ossification of vomer bone in indigenous sheep fetuses collected from uteri of indigenous ewes slaughtered in Mosul city, which prepared by using modify double staining method in younger age or maceration with potassium hydroxide (KOH) or with fly larvae in old ages.

The first sign of vomer bone demonstrated as a small areas (3mm) in the (53) days old of indigenous sheep fetus as a two bilateral ossification centers which located below and above the vomeral body which formed by intramembranous ossification in the membrane covering the cartilaginous nasal capsule.

The results revealed that the relative increase in the vomer bone during thirteen successive weeks [8^{th} – 20^{th} weeks]of indigenous sheep fetal age, that the greatest relative increase in vomer bone length was at the 8^{th} week, while the greatest relative increase in vomer bone height was in the 11^{th} week of indigenous sheep fetal age.

INTRODUCTION

The development of heads is necessarily an extremely complex process since organs and tissues having completely different functions are growing in close physical association with each other [1].The vomer bone is a thin trapezoidal bone of the skull forming the posterior and inferior parts of the nasal septum. It extend from the ventral surface of body of the presphenoid to the palatine process of the premaxillary, it's Y-shaped in cross section and form the ventral part of the median septum of the nasal cavity. The vomer is freer in sheep than in the ox, only one fourth of the ventral border being as associated with the floor of the nasal cavity. The dorsal border is less concave and has thicker edges than it in ox. The body is deeper ,plate like, and terminates in a vertical caudal border, which is more rostral than in ox [2].

The vomer share in the transfer of pressure tensions to the base of the cranium on a level with it's symmetry in the mastification [3], also play an important role in the growth and support of the upper jaw of the dog [4].

The vomer bone formed by intramembranous ossification in the membrane covering the cartilaginous nasal capsule in human [5],and the connection between the cartilaginous septum and vomer only consists of small and very loose layer of connective tissue in human [6].the cartilaginous nasal capsule and septum play an important role in pre-and perinatal human facial growth [7].The main sources of data relating to the first appearance of prenatal ossification centers whether in human or animal skeletons fetuses based on specimens cleared in dilute potassium hydroxide and stained with alizarin red S [8,9,10,11,12,13,14,16 and 17].

The purpose of the present study to describe the onset and the normal pattern of the growth sites of the vomer bone according to age and sex by using two measurements.

MATERIALES AND METHODS

Ninety two [92] fetuses were collected from uteri of indigenous ewes slaughtered in Mosul city .The crown-rump length of each fetus was measured by using vernier and a measuring tape. This length used in Richardson formula to find the estimated age of each fetus [18]

Estimated age = {(crown-rump length (cm) + 17} × 2.1

The heads of young fetuses separated from the occipito-atlantal junction (or joint),then the skulls prepared by skinning, fixing in 90% ethyl alcohol, then staining with modified double staining method by using mixed solution of alizarin red S and Alcian blue (Fig1 and 3). the specimens then macerated in 2% potassium hydroxide solution (KOH),then cleared by using glycerin, and examined by using stereoscopic microscope and macrolens, while the skulls of older ages prepared by using two methods :

1. Maceration with different concentrations of potassium hydroxide solution (KOH), (Fig 2) [14].
2. Maceration by using fly larvae, (Fig 4). [14 and 15].

The growth and development of vomer bone followed up by examining the sagittal sections of skulls during thirteen weeks [8^{th}-20^{th} weeks]of fetal age. The examination has been done by took measurements using vernier, measuring tape and graph paper:

1. Length of the vomer bone (L.V.): represented by the horizontal line extended from the body of the presphenoid bone to the rosteral point of the length of the bone, (Fig2).
2. Height of the vomer bone (H. V.): represented by the vertical line extended from the highest point of the dorsal border to the lowerest point of the ventral border, (Fig2).

The data of these measurements submit to the statistical analysis to find analysis of variance, then followed by the least significant test [19]to demonstrate the significances of variance present in these measurements during the studied weeks [8^{th}-20^{th} weeks] of fetal age.

RESULTS

This study showed that the first sign of growth of vomer bone was at [53] days old in indigenous sheep fetuses, which distinguished as a small area (3 mm),(Fig1) as two bilateral ossification centers which located below and above the vomeral body, which formed by intramembranous ossification in the membrane covering the cartilaginous nasal capsule which detected by double staining method that give a good results to study the ossification centers, growth pattern , bone calcification and tack the measurements in younger ages, while the skulls of old ages which macerated by potassium hydroxide method give chance to saving chemical days and other chemical materials and to tack the measurements of bone, while the skulls of old ages which macerated by fly larvae method also for saving chemical days and other chemical materials and give a chance to study each bone individually and compare the parameters of the same bone in different phases of pregnancy . Later, the two bilateral ossification centers fused caudally below the cartilaginous nasal septum, this changing into a U-shaped bone when observed in the frontal plane. When the bony material apposition caudally the U-shaped of vomer bone gradually changes into a Y-shape, it was obvious that increasing in the size of the vomer could mainly be ascribed to apposition on the posterior surface and the superior margin, this change continue until adult age. The growth of vomer bone continue rostrally, caudally and dorsally and it's growth rostrally is faster than caudally, while it's growth dorsally is very slowly. The growth pattern implied that sliding of the vomer bone must take place in relation to the ethmoid bone and the cartilaginous nasal septum and the calcification is appeared clearly in the

ventral surface or edges of vomeral body. The growth of vomer bone and nasal septum correlated with midline facial growth.

The results of statistic analysis done on the relative increase in the length and height of the vomer bone,(Fig 2) showed that the greatest average of relative increase in length of vomer bone was in the 8th week of fetal age which significantly variance from the same average in the other studied weeks,(Fig 5) while the greatest average of relative increase in height of vomer bone was in the 11th week of fetal age, which significantly variance from the same average in the other studied weeks (Fig 6).

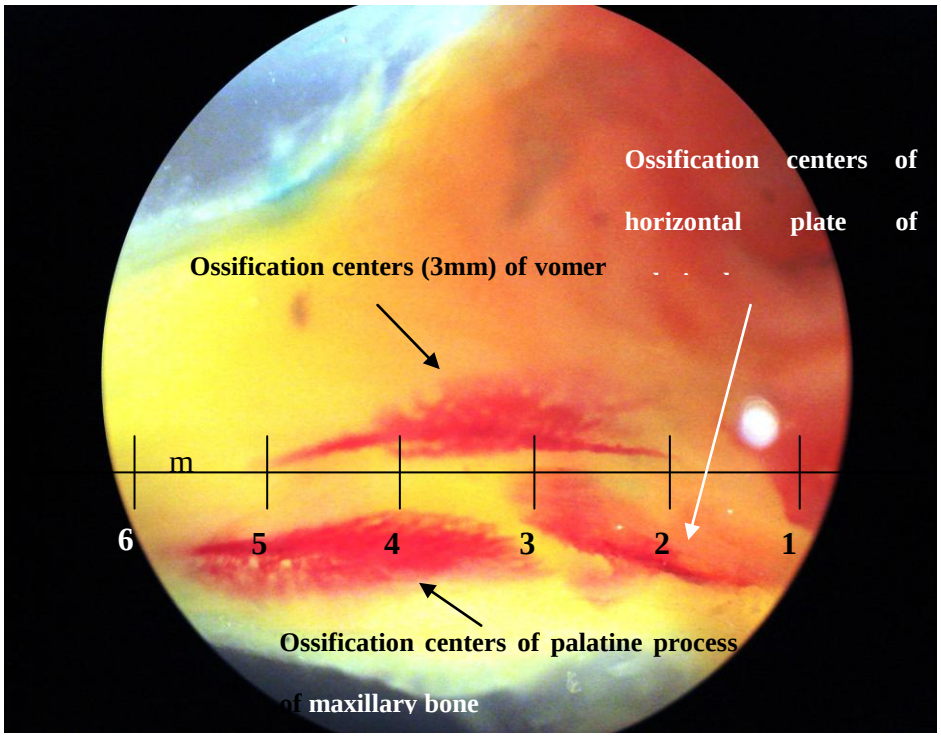

Fig (1): skull of indigenous sheep fetus with an estimated age of [53]day old prepared by double staining method. (Ossification centers 3mm in length), ossification by the intramembranous

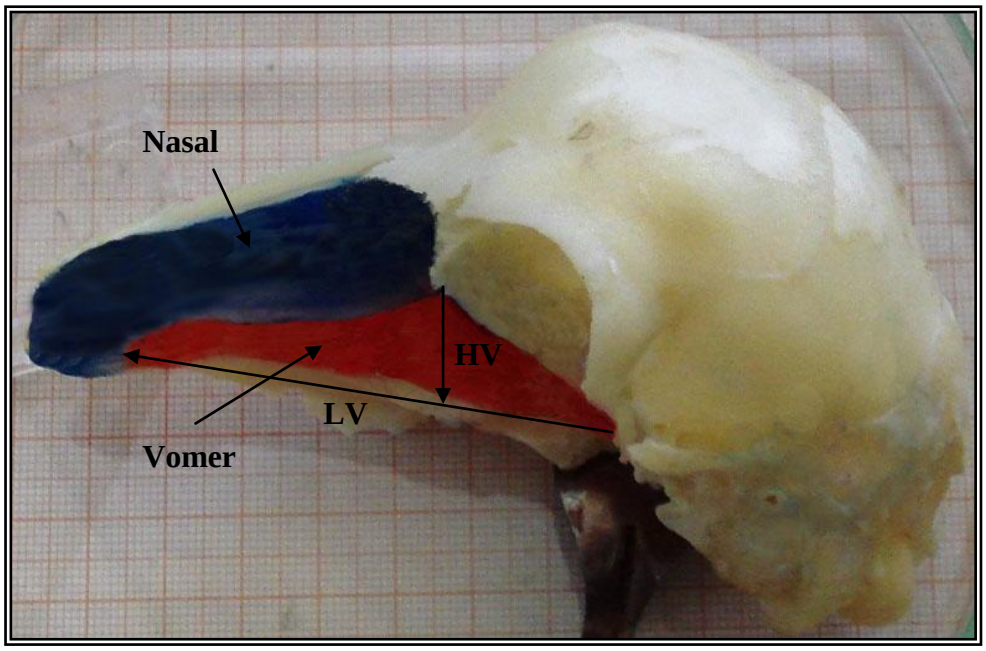

Fig (2): skull of indigenous sheep fetus (left side) with an estimated age of [141]day old macerated with potassium hydroxide. One side of nasal cavity lifted to demonstrate the nasal septum (dark blue) and vomer

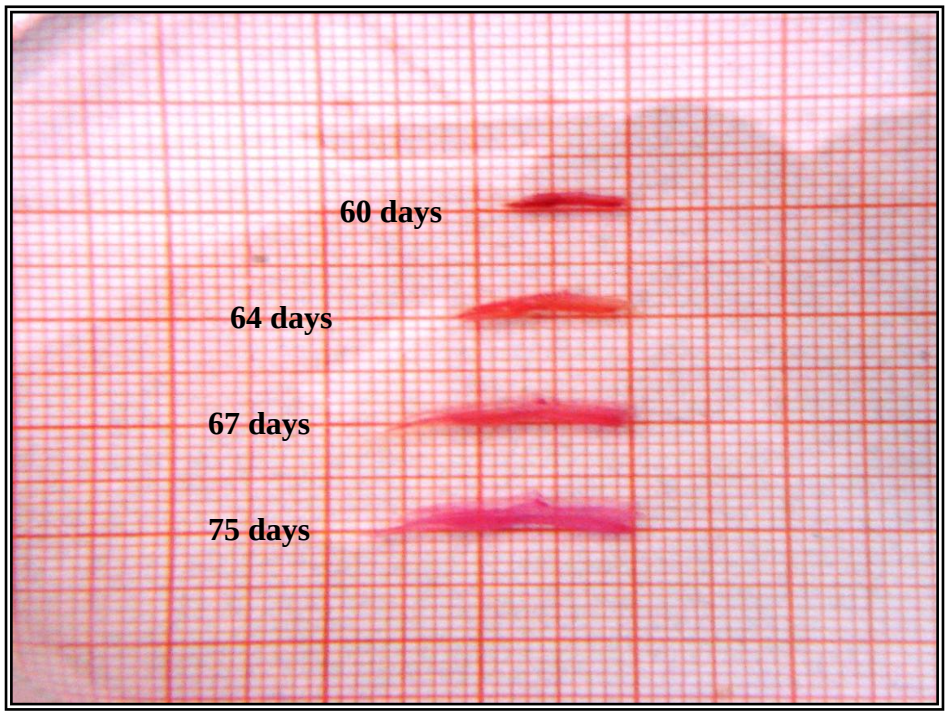

Fig (3): Vomer bones of indigenous sheep fetuses with an estimated age from[60-75]days old prepared by double staining method and measured their length and height by using graph paper.

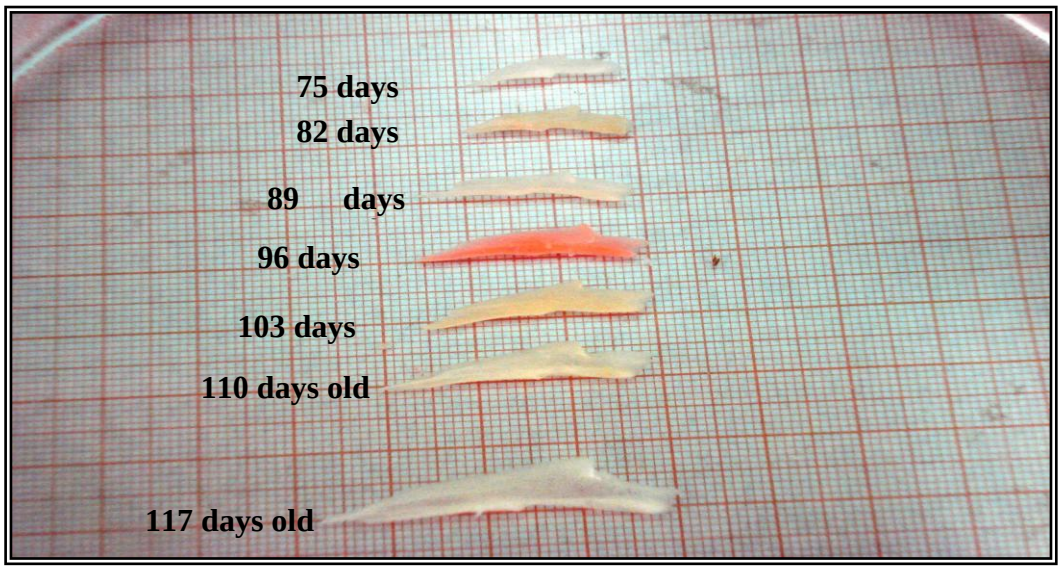

Fig (4): Vomer bones of indigenous sheep fetuses with an estimated age from[75-117]days old prepared by fly larvae method and measured their length and height by using graph paper.

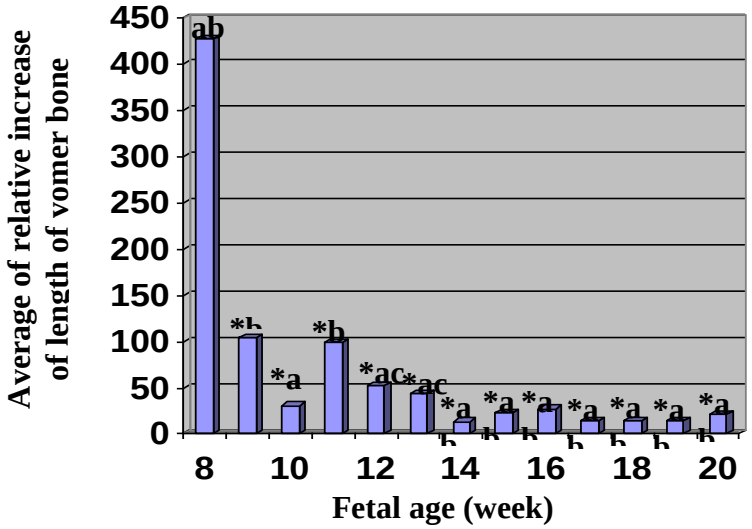

Fig 5: The averages of relative increase in the length of vomer bone of indigenous sheep fetuses.

***: differ significantly in this week than in the 8th week at p< 0.05.**
a: differ significantly in this week than in the 9th week at p< 0.05.

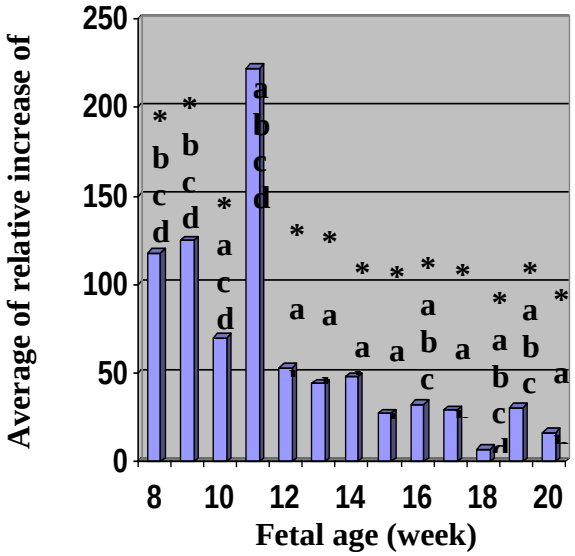

Fig 6: The averages of relative increase in the height of vomer bone of indigenous sheep fetuses.

***: differ significantly in this week than in the 11th week at p< 0.05.**
a: differ significantly in this week than in the 9th

DISCUSSION

The results of this study show important correlation between the developments of vomer bone and nasal septum subsequent midfacial growth at [49-140] days old of indigenous sheep fetuses. These results agree with results of the study on human fetuses [5, 7, 20,21,22,23 and 24].

The early initiative point of vomer bone growth was at [53] days old of indigenous sheep fetuses, these results agree with the facial development studies done on human and sheep fetuses [5,7,8,9,10,11,12,13,14 and 25], and with results of [7,25and 26] on human fetuses who suggests that the vomer bone is a primary growth center that appear as two bilateral ossification centers

which located below the vomeral body which formed by intramembranous ossification in the membrane covering the cartilaginous nasal capsule, which then act with nasal septum to pushes or thrust the midfacial bones downward and forward .

The results of statistic analysis showed presence of significant variance in the average of the relative increase in length and height of the vomer bone among some of the studied weeks of fetal age, but the maximum development in this bone occurred in 8^{th} and 11^{th} weeks, this mean the sensitive period of most rapid longitudinal growth of the vomer bone occure in the second trimester of pregnancy of indigenous sheep, this result agree with general features and with results of many other studied on the skeleton development (in general) of human, sheep and goats fetuses and with results on many other studies on the vomer bone (in special) of human fetuses [5,7,9,10,12,13,14,25,26,27,28 and 29].

AKNOWLEDGE

The author would like to thank the Department of Anatomy and the College of Veterinary Medicine in University of Mosul which is present in it to support this work.

دراسة شكلية قياسية لتطور عظم الميكعة في اجنة الاغنام المحلية

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الخلاصة

تضمنت هذه الدراسة تحديد الفترة الزمنية لحدوث التعظم في عظم الميكعة لاجنة الاغنام المحلية المجموعة من أرحام إناث الأغنام المذبوحة في مجازر مدينة الموصل والتي تم تحضيرها باستخدام طريقة الصبغة المزدوجة المحورة في الاعمار الصغيرة،أو باستخدام التعطين بهدروكسيد البوتاسيوم او يرقات الذباب في الاعمار الكبيرة.

إن العلامة الأولى لظهور عظم الميكعة هي كمساحات صغيرة(3 ملم) في اليوم [53] من عمر جنين الأغنام المحلية كمركزي تعظم وحشيان يقعان أسفل وأعلى جسم الميكعة والذي يتكون بطريقة التعظم داخل الغشاء في الغشاء المغلف (او المحيط) بمحفظة الانف الغضروفية.

أظهرت النتائج كذلك تتبع الزيادة النسبية في طول وارتفاع العظم الميكعي خلال ثلاثة عشر أسبوعا [8-20 أسبوعا] من عمر اجنة الاغنام المحلية، حيث ظهر أن أعلى زيادة نسبية في طول العظم الميكعي كان في الاسبوع الثامن من عمر الجنين،بينما كانت أعلى زيادة نسبية في ارتفاع العظم الميكعي في الاسبوع الحادي عشر من عمر اجنة الاغنام المحلية.

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