CALVARIAL TUMOURS- A TEN-YEAR STUDY OF SEVENTY PATIENTS

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ABSTRACT

BACKGROUND
The aim of this study was to find out epidemiologic and clinical features of benign calvarial lesions in Neurosurgery Department at SKIMS, Srinagar, Kashmir. The aim of this article is also to describe imaging features of benign lesions.

METHODS
Seventy patients of skull tumours presented to neuro surgery department between 1985 to 1994. Parameters such as gender, symptom, age, clinical signs, radiological findings in x-ray and histopathological reports were evaluated.

RESULTS
The results of this study showed that most of such tumours were found in parietal area followed by frontal area skull. Such lesions were more common in males. Most common type of calvarial lesion was fibrous dysplasia, followed by Osteoma and Eosinophilic granuloma. Neurological symptoms were absent in most of the patients.

CONCLUSIONS
Benign skull lesions are infrequent. Calvarial lesions were commonly seen in adult males and mostly found in parietal area. Most common lesion was fibrous dysplasia. Of primary importance is the recognition of such lesions by primary care physicians and referral to the surgeons so that they are diagnosed, and appropriate treatment plan devised.

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BACKGROUND

Vault of the skull is made of membranous bone, whereas bone develops from cartilage. This important difference in development leads to variation of lesions that occur in vault & base. Skull lesions are common in the practices of many primary care physicians often presenting as painless, palpable mass or as an incidental finding on radiographic studies. Such lesions need further investigation and neuro surgical consultation to select a suitable treatment.

- Radiologists are faced with lesions covering a wide range of diagnosis, often poorly known and with very few specific imaging features. The recognition of skull vault lesions and their pathologic characteristic requires, first of all good knowledge of normal anatomy & its variants.
- Although most of the lesions have no specific features, the correlation of topographic and imaging characteristics (eg. Lytic lesion, sclerotic, diffuse or focal, single / multiple lesions with clinical data can guide diagnosis.
- Literature reveals very few studies, especially in the past 20 years in north America, that too at the patient demographics and characteristics of benign skull lesions. In response to this finding we reviewed 10 years' experience of neurosurgery with respect to benign skull neoplasms.

The study assessed the age, sex, clinical signs, radiology findings besides histo-pathological reports of such patients who were treated in Neuro surgery department of SKIMS during 10 years (1985-1994)

METHODS

This study was carried out in Neuro surgery Department of SKIMS Srinagar Kashmir.

The study included both retrospective and prospective cases of calvarial tumours. The patients included in this study were those admitted directly in hospital and those who were referred from other hospitals in Kashmir.

Retrospective Group

We reviewed our institutional database after retrieving records from medical records and pathology department from 1985-1992.

Prospective Group

All such cases admitted for treatment during the course of study i.e. from 1992-1994.

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Initial Assessment

Detailed history was taken and practical included age, sex, duration of swelling or deformity, anatomical site of swelling. Leading questions of any history of trauma or exposure to local injection or local radiation were noted. Radiological findings were recorded after proper x-ray and C.T. done where ever indicated. Imaging characteristics like lytic dense bony shadow, punched out lesions, calcifications, diffuse or focal, single or multiple with clinical details were recorded.

All such patients had FNAC & later on specimen biopsy.

Study excluded metastatic tumours to skull.

RESULTS

From 1985 to 1994, seventy patients were received for neurosurgical consultation and subsequently management. Maximum number of patients 29 (41.42%) were found in age group of 21-30 years, followed by 11-20 years (31.42%). least common age group was above 40 years. Youngest patient was 10 months old (Table 1).

Within this population there was predominance of men. (male to female ratio 4:3) (Table 2).

The majority of patients 57 (81.42%) presented with swelling over the skull. This was followed by deformities of skull in 12 patients (17.14%). In majority of patients, skull swelling was of 1-5 years duration. (Table 3).

There was no significant history of trauma or exposure to local injection or radiation.

The most common anatomical location of lesions was in the parietal bone in 45 patients (64.28%), followed by frontal bone in 20 patients (28.57), temporal bone in 4 patients (7.14%) and occipital bone in 1 patient (1.42%) (Table 4).

Radiologic investigation in all patients included plain X-ray radiography of skull & C.T. Scan in selected patients. Radiological findings revealed lytic & sclerotic lesion as commonest lesion in 21 patients (30%) followed by dense bone shadow in 16 patients (22.85%), punched out osteolytic lesion in 13 cases (18.57%), lytic lesion in 11 cases (15.71%), calcifications in 5 patients (7.14%) and sunburst appearance in 04 patients (5.71%) (Table 5).

Commonest pathological lesion was fibrous dysplasia in 21 patients (30%), followed by osteoma in 16 patients (22.85%), eosinophilic granuloma in 13 patients (18.57), epidermoids and dermoids in 9 patients (12.85%). Further organized cephalhaematoma in 5 patients (7.14%), Haemangioma of skull in 4 patients (5.71%) and primary osteogenic sarcoma in 2 patients (2.85%).

Age Group	No. of Cases (%)
0-10 Years	13 (18.57)
11-20	22 (31.42)
21-30	29 (41.42)
31-40	04 (5.71)
41-50	02 (2.85)

Table 1. Age Group (n= 70)

Gender	Number of Cases (%)
Male	41 (58.57)
Female	29 (41.42)

Table 2. Gender (n=70) Male Female Ratio 4:3

Clinical Presentation	No. of Cases (%)
Swelling Over the Skull	57 (81.42)
Deformities of skull	12 (17.14)
Localized Headache	01 (1.42)

Table 3. Clinical Presentation (n=70)

Anatomical Site	Number of Cases (%)
Parietal	45 (64. 28)
Frontal	20 (28.57)
Temporal	04 (5.71)
Occipital	01 (1.42)

Table 4. Anatomical Site (n = 70)

Plain Radiology Skull & CT Scan	No. of Cases (%)
Lytic & Sclerotic Lesion	21 (30)
Very Radiodense Sclerotic Lesion	16 (22.85)
Punched Out Osteolytic Lesion	13 (18.57)
Lytic Lesion	11 (15.71)
Calcification	05 (7.14)
Sunburst Appearance	04 (5.71)

Table 5. Plain Radiology Skull (n =70)

Lesion Morphology	Number of Cases (%)
Fibrous Dysplasia	21 (30)
Osteoma	16 (22.85)
Eosinophilic Granuloma	13 (18.57)
Epidermoids & Dermoids	9 (12.85)
Organised Cephalhaematoma	5 (7.14)
Haemangioma of Skull	4 (5.71)
Primary Osteogenic Sarcoma	2 (2.85)

Table 6. Lesion Morphology (n=70)

DISCUSSION

Fibrous dysplasia is a common lesion in adolescent and young adults that may affect calvarium.[1] Fibrous dysplasia may be considered a potentially premalignant bone forming condition.[2] It is a developmental anomaly of bone forming mesenchyme in which woven bone does not properly mature to lamellar bone, accompanied by a surrounding overgrowth of well vascularized fibrous stroma.[3] More expansible lesions usually grow outward and present with firm swelling.[4] Outer table is more prominently affected than inner table.[5]

There patterns of craniofacial fibrous dysplasia can be observed: a mixed pattern with lytic and sclerotic lesion, a homogenously sclerotic and predominantly lytic pattern.

The skull is involved in 27% of patients with monostatic fibrous dysplasia.[6] Malignant degeneration occurs in approximately 0.4% of cases.[7]

Our series involved 14 cases (66.66%) in 10-20 years age group, followed by 7 cases (33.33%) in age group of 21-30 years.

In our study we found 21 cases (30%) of fibrous dysplasia. Fifteen patients (71.42%) had lesion in parental area and 6 patients (28.57%) had lesion in frontal area. X-ray skull showed expanded diploe with surrounding sclerosis and lytic pattern. Excised material showed prominent bony trabeculae.

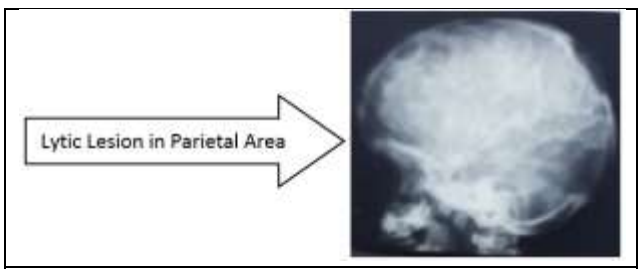

Figure 1

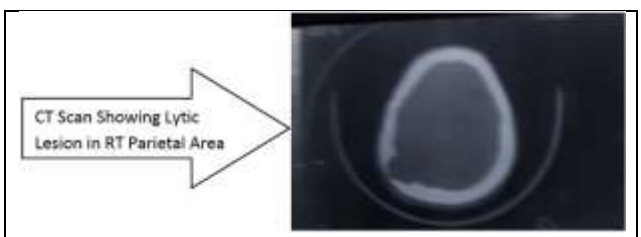

Figure 2

Osteomas are slow growing osteoblastic tumours. They are most common primary bone tumour of craniofacial skeleton.[8] We found 16 cases of osteoma. These osteomas were found mainly in females, with female to male ratio of 2:1. This is almost similar to literature reports, which estimate ratio 3:1. We found 14 patients in age group of 21-30 years & 2 patients were 45 years of age. Most common location for neoplasm was in the parental bone (11 cases), followed by frontal bone (5 cases). Plain X-ray skull showed well defined radiopaque lesion arising mainly from outer table of skull.

Microscopically osteomas consisted of tightly packed irregular lamellar bone with small bone marrow.

Figure 3

Eosinophilic Granuloma (Langerhans Cell histiocytes) Eosinophilic granuloma is defined as a proliferation of Langerhans cells accompanied by eosinophils, histiocytes, lymphocytes, neutrophils and scattered plasma cells.

Thirty four percent of such neoplasms occur in children younger than 4 years and 74% occur in patients younger than 20 years.[9]

Although any bone may be affected, skull is the most common site.[2] Patients may present with local pain and palpable tender calvarial mass that can progress, coalesce or regress.[10]

13 cases of eosinophilic granuloma were noted in our study. Eight cases (61.53%) found in 2nd decade of life followed by five cases (38.46%) in 1st decade of life. Nine cases (69.23%) were found in parietal and 4 cases (30.76%) in temporal bone of skull.

X-ray showed sharply demarcated or punched out osteolytic lesion without sclerotic rim. Both inner & outer tables were involved in most of them.

Microscopically a mixture of pleomorphic histocytes with indented contours and inflammatory cells mostly eosinophils were seen.

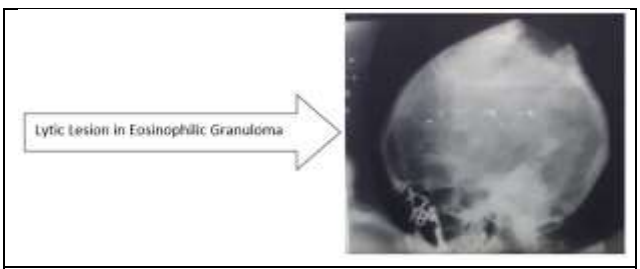

Figure 4

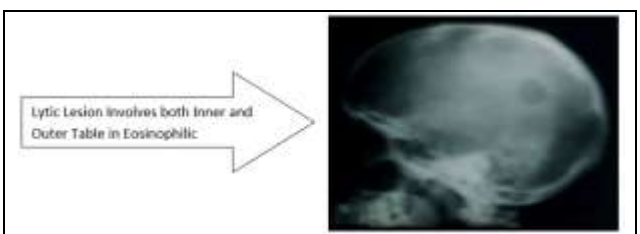

Figure 5

Epidermoids and Dermoids

Epidermoids and dermoids are ectodermal inclusion cysts lined by epithelium. Epidermoids only have squamous epithelium. Dermoids contain hair, sebaceous and sweat gland and squamous epithelium. Majority of epidermoids and dermoid cysts are congenital and are rarely due to trauma or iatrogenic. They manifest as non-tender, slowly growing masses, enlarging over years or decades.[11] Most of these lesions present in the first four decades of life. Epidermoids are typically lateral in location and dermoids usually found in midline.

Osteomas & epidermoids typically appear as encapsulated, unilocular cystic lesions and appearance of cystic contents varies depending on its composition.[5] They appear as expansile, osteolytic lesions with smooth sclerotic margins. They often expand, remodel and can erode the outer & inner table.

In our series we had 9 cases of epidermoids & dermoids. It included 6 males & 3 females. We found seven patients in age group of 21-40 years & 2 patients in age group of 0-10 years.

Five patients had lesion in frontal, 3 in parietal and one had lesion in occipital are of skull. Plain X-ray showed osteolytic lesion with sclerotic margin.

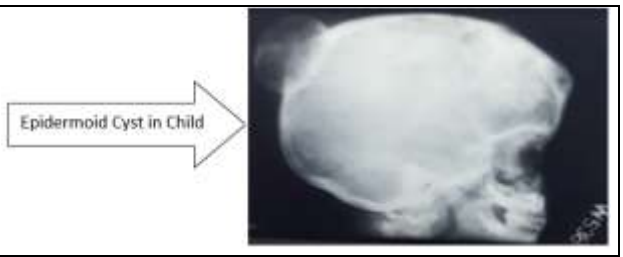

Figure 6

Figure 7

Organised Cephalhaematoma

Cephalhaematoma is a subperiosteal haemorrhage confined by the cranial sutures. Majority of them resorb by 1 month of age[12] and overlie the parietal bone.[11] After failure of haematoma resorption progressive subpericranial osteogenesis results in a calcified cephalhaematoma. The incidence of calcification has been reported to occur in 3-5% of all cephalhaematomas.[12]

CT features included uniformly homogenous hypodense, non-enhancing core encased by bone.[12]

After 3-6 months, the cephalhaematoma feels hard[12] and plain X-ray & CT show uniform densely calcified mass that is located immediately adjacent to the outer tble and is contained within the periosteum.

In our series we had 5 cases of organized cephalhaematoma. All of them were found below 2 years of age. They were mostly found in parietal area of skull.

Haemangioma of Skull

Intraosseous haemangiomas account for 0.7% of all osseous neoplasms, with most of these seen in vertebral column.[13] The skull is the next most frequent site. Haemangiomas have predilection for the frontal & parietal bones.[14]

In plain X-ray osteolytic area with central bone spiculation, classic honey comb appearance and some surrounding sclerosis (sunburst appearance).

Microscopic examination of excised material showed an array of bony trabeculae with conglomeration of blood vessels in the marrow spaces.

Four cases of Haemangioma skull were found in our series. 3 cases were in 21-30 years age & case was in 5 years of age group.

All of them were found in frontal area of skull.

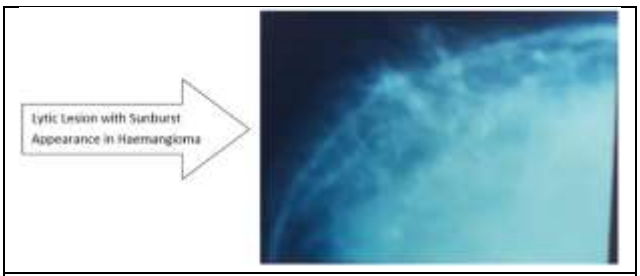

Figure 8

Primary Osteogenic Sarcoma

Bone sarcomas arising from the skull are rare. Osteogenic sarcoma is a malignant mesenchymal neoplasm in which tumour cells directly produce osteoid or immature bone. Many lesions also contain other elements, particularly fibrous or chondroidal components. Numerous histological types of osteosarcoma have been described.[15] Calvarial osteosarcomas occur mainly in third & fourth decade of life.[16] Osteosarcomas commonly have an osteolytic appearance with a variable amount of osteoid and /chondroid mineralization and ill-defined border.

2 cases of osteogenic sarcoma were noted in our series. One case was found in 2nd decade of life and one is 3rd decade of life. Both were found in parietal area.

X-ray and CT of such patients showed lytic lesion i.e. ill-defined borders.

CONCLUSIONS

A wide spectrum of neoplasms and non-neoplastic lesions can involve the calvarium, and the pathological features of these lesions influence their radiologic appearance.

Study revealed that calvarial tumours are rare as only 70 cases were found over 10 years period.

The results show that majority of calvarial tumours were found in the age group of 21-30 years.

The calvarial tumours were more common in males than in females.

Maximum number of patients presented with swelling over the skull.

The most common anatomical location in such lesions was in the parietal bone.

Radiological findings revealed lytic & sclerotic lesion as the commonest lesion, followed by dense bony shadow and punched out osteolytic lesion.

In majority of patients, fibrous dysplasia was found as the commonest pathological lesion followed by osteoma and eosinophilic granuloma.

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consents for their images and other clinical information to be reported in journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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