ORIGINAL ARTICLE

Multi-disciplinary Approach: A Modality of Choice in the Management of Osteolytic Skull Lesions

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ABSTRACT

Introduction: *Multi-disciplinary approach towards the management of osteolytic skull lesions has evolved as the standard modality of treatment in recent years. Multiple disciplines including Neurosurgery, Anaesthesia,Neuro-Radiology, Plastic Surgery and Neuro-Oncology being working in co-ordination have improved outcome in such cases.*

Objective: *To discuss multi-disciplinary approach as a standard treatment modality of choice.*

Study Design: *Prospective descriptive study.*

Material and Methods: *Patients admitted and operated at the Department of Neurosurgery of PGMI/Lahore General Hospita from July 2015 to July 2016. A total of 20 (n = 20) were study subjects.*

Results: *Among 25 patients that were operated for an osteolytic skull lesion 12 were male and 13 female patients with age ranging from 10 to 60 years. Major complaints swelling (painfull/painless, n = 20), headache (n = 18), vomiting (n = 20), fits (n = 15) and bleeding ulcer (n = 2). On the basis of clinical and MRI diagnosis and biopsy majority had ewing sarcoma (n=10), 5 had meningioma, 1 had chondrosarcoma and 4 had metastatic skull lesion. All of them (n = 20) underwent surgery related to their clinical and MRI findings which included biopsy, excision of lesion, cranioplasty and flap rotation. Complications included infection in 2 patients, which was treated with antibiotics and mortality in 1 case.*

Outcome: *Neurologic status and outcomes were compared with preoperative findings at 1^{st} and 2^{nd} post-operative weeks. Headache, fits, vomiting significantly improved in all patients.*

Follow-up: *All patients had a follow up at 1 and 3 months post-operative.*

Conclusions: *A multi-disciplinary approach is the modality of choice in managing an osteolytic skull lesions.By involving different specialities in a team effort to manage an osteolytic skull lesion can greatly improve the outcome in such cases.*

Key Words: *Osteolytic skull lesion, cranioplasty, flap rotation.*

INTRODUCTION

Solitary lytic lesions of the skull may originate primarily from bony structures, or they may be secondary to invasion of the skin- or brain-based lesions into bony structures. Some primary tumours also metastasize to skull. Well defined borders and sclerotic margins are characteristic of benign lesions.

In general, anatomical variations parietal foramen, parietal thinning, and Pacchionian granulation, may mimic lytic lesions, and compise 60% of cases.in general population seven diagnosis include 85% of all cases-by decreasing order, dermoid/epidermoid cysts, hemangioma, metastasis, multiple myeloma, Langerhans histiocytosis, paget disease of bone and fibrous dysplasia. In children and young adults, the differential diagnosis of solitary lytic lesions includes eosinophilic

granuloma, epidermoid-dermoid, osteoblastoma, hemangioma, and aneurysmal bone cyst. In older patients with multiple lytic lesions, metastases and multiple myeloma should be considered. The rare cause of an osteolytic skull lesion includes Ewing's sarcoma in children and meningioma in adults.

The symptomatology and presentation varies in such lesions. Patients with more aggressive lesions may present with short history. The signs and symptoms may be of raised ICP, headache being the most common symptom.

The lesions can have extracranial extension into soft tissue and may present as painfull/painless localized swelling.

Depending on the diagnosis of the lesion, a multidisciplinary approach is applied to manage such patients.

The specialities involved are Neurosurgery, Neuro-anaesthesia, Neuro-radiology and Plastic surgery. Neuro-oncology may also be involved in malignant cases.

MATERIAL AND METHODS

All the patients were admitted through OPD and operated in Neurosurgery unit-III of PGMI/Lahore general hospital, Lahore. The study duration was 1 year from July 2015 to July 2016 (n = 20) were the study subjects. It was a prospective descriptive study. Informed consent for the surgery and for induction in the research was taken from either patient or their legal guardians. All risk, benefits of the surgery and the research was explained. Surgery was performed according to the standard procedure according to clinical, histopathological and MRI diagnosis. Patient were discharged 2 days after removal of stitches depending on clinical stability of the patient. Neuro-logical assessment was done at 1st and 3th post-ope-rative month at out – patient department. Those patients who required chemo/radio therapy post-operative were referred to Neuro-oncologist.

The surgeries performed included craniotomies with total excision of lesion along with involved bone+1cm macroscopically normal bone, burr hole biopsies, cranioplasty, flap rotation. Embolization in one patient was performed by neuroradiologist.

RESULTS

In our study a total of 20 patients were included. Age range was from 8 to 65 years. All had painfull/painless swelling.18 had headache and vomiting while fits in 5 and 2 patients had bleeding ulcers. All patients had CT-scan and MRI done. DSA was done in 8 patients.

In 16 patients the lesion was completely excised along with 1cm of macroscopically normal bone. 2 patients had just biopsy done. 2 patients had rotational flap done. Pre-operative embolization was done in 4 patients.

Cranioplasty to cover the bone defect was done in 5 patients 2 to 3 months later.

CLINICAL PRESENTATION

The clinical presentation of the patients had variations, though, few signs and symptoms were similar in different cases. The major presenting complaints included swelling (painfull/painless), headache, vomiting, fits, bleeding ulcers, proptosis and visual loss.

Few patients also had extracranial signs/symptoms who had metastatic lesions.

Investigations

Specific investigations included CT brain, MRI brain, BONE SCAN, biopsy and DSA.

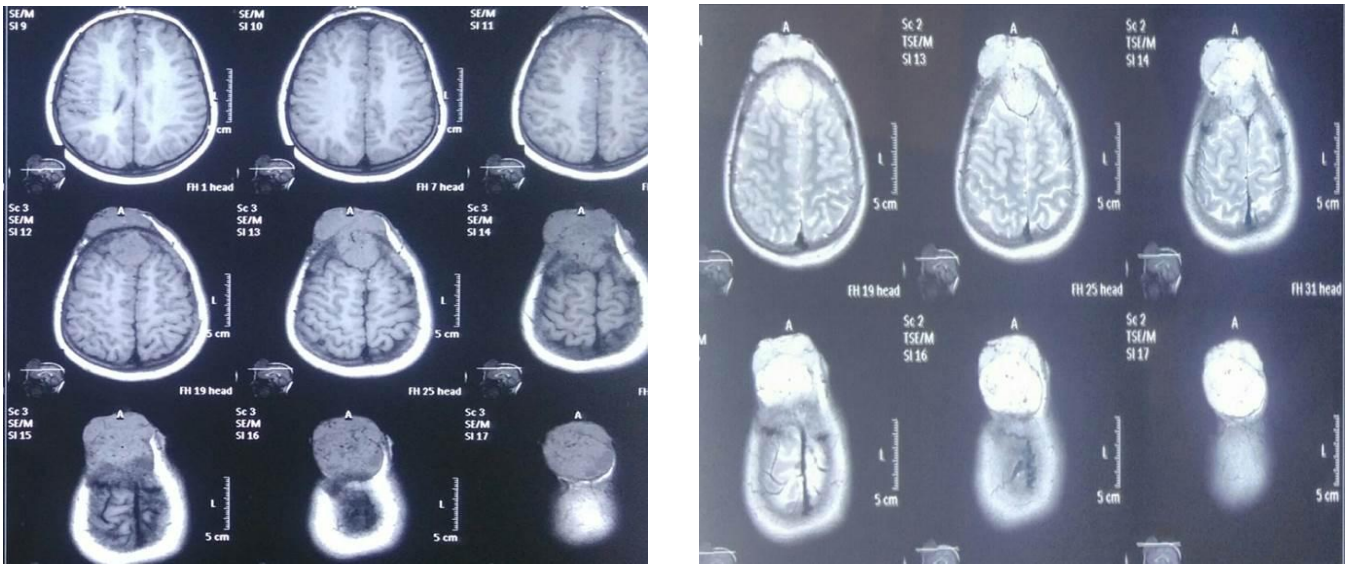
Diagnosis

Based on history, examination and investigations diagnosis of each lesion was made. All lesions were osteolytic located at different areas of skull.

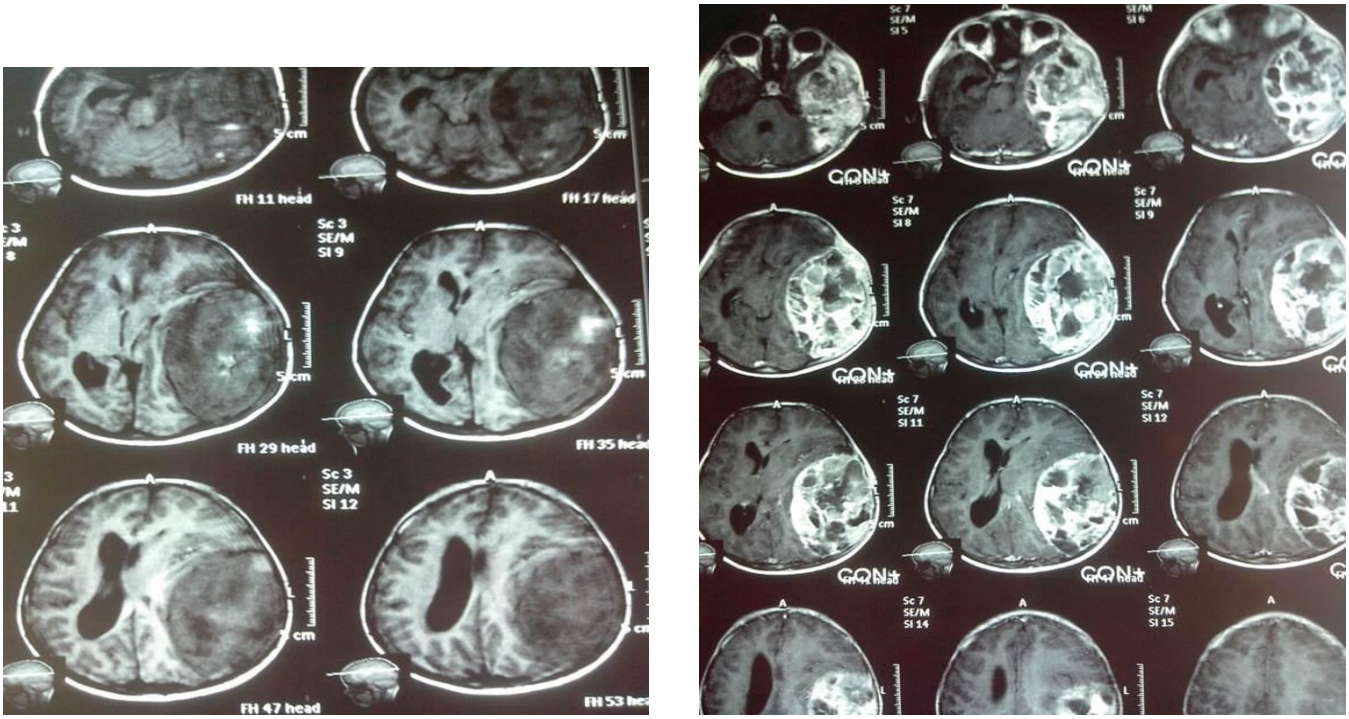
Diagnosis	No	Age Range	Sex
Ewing sarcoma	10	8 – 16	M-5/F-5
Meningioma	5	30 – 65	M-3/F-2
Chondrosarcoma	1	35	M-1
Metastatic lesions	4	45 – 65	M-3/F-2

Surgical Procedures

Depending upon the indications in different cases following surgical procedures were done adapting a multidisciplinary approach (1) *biopsy, (2)excision of lesion (3) cranioplasty and (4) flap rotation (5) VP-shunt. Few patients also had diagnostic and therapeutic DSA.*



Case 1: *Metastatic Lesion.*



Case 2: *Ewing Sarcoma.*

Complications

There were no complications related to surgery or anaesthesia per-operatively. During the first 7 days post-operatively 1 patient developed hydrocephalus, for which VP-shunt was done and 2 patients had wound dehiscence and one patient who had metastatic lesion with multi-organ involvement died.

DISCUSSION

Skull or the calvarium encases the brain parenchyma. It consists of an inner table, outer table and the space between the two layers is known as diploe. The thicknesses of outer and inner table are 1.5 mm and 0.5 mm, respectively. Focal lesions in skull may arise from bony structures, or they may be secondary to

invasion of the skin — or brain-based lesions into bony structures. Benign lesions have well-defined borders and sclerotic margins whereas malignant lesions lead to destruction. Plain radiography is the first step in radiological evaluation followed by computed tomography (CT) and magnetic resonance imaging (MRI) if required. Imaging alone cannot differentiate various isolated atypical lytic lesions involving the skull. Clinical and radiological correlation is mandatory in reaching to a diagnosis. Histopathology remains the gold standard.

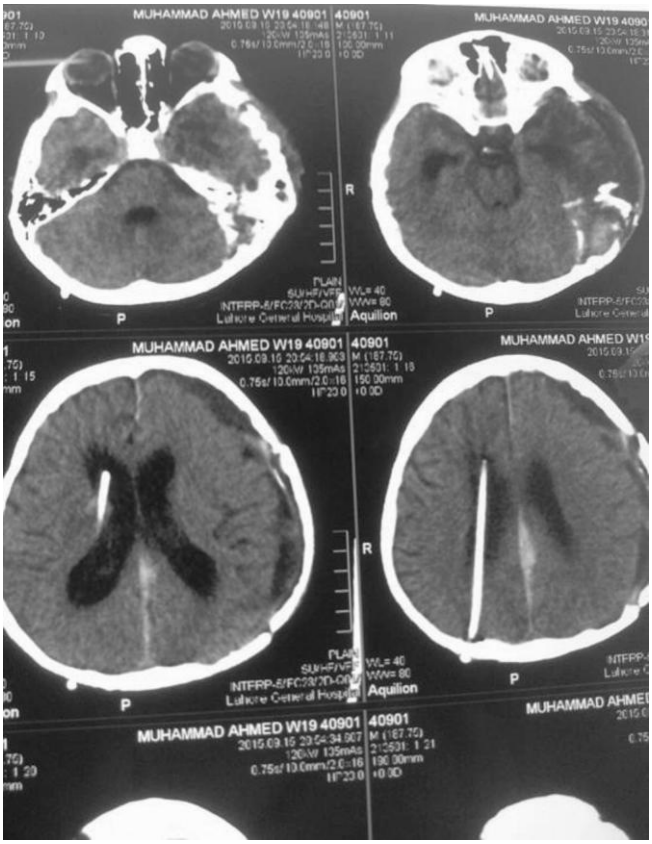


Fig. 3: *Post-operative Case 2 (Ewing Sarcoma).*

Lytic lesions of the skull can be classified into three groups, 1) begnin lesions 2) tumour like lesions 3) malignant lesions. Osteolytic skull lesions are infrequent finding.in a retrospective study by Hong et al., the most common histopathological diagnosis metastasis (n = 9), langerhan's cell histiocytosis (n = 9) and intra-osseous haemangioma (n = 5). Osteolytic skull lesions could be found in any age group.

MRI contributes to understanding. The presentation of skull metastases varies depending on the pathology. Although they are silent, painless and diagnosed incidentally by the physician most of the time, they may cause pain, skin ulcerations, and more importantly neurological symptoms due the compression of the underlying brain cortex. Skull metastases may reach considerable size and lead to compression of dural sinuses and cranial nerves.

Group	Histology	Frequency
Primary skull tumours	Ewing sarcoma Malignant meningioma chondrosarcoma	10 2 1
Benign lesions	Meningioma	3
Skull metastasis	CA lung Breast carcinoma	2 2

The management of such variety of lesions need a multi-disciplinary approach to be adopted. The lesions which are highly vascular need pre-op embolization to be done 2 to 3 weeks before surgery. The histopathalogicaly proven malignant lesions involve neuro-oncology department. The lesions presenting with ulcers need flap rotation, involving plastic surgery department.

In our series the bone defect after resection ranged from 4 to 6 cm. Reconstruction of the skull defect due to a lesion was always performed in a second session depending on the patient's preference even when the case was benign. There was need for time to determine whether the lesion was benign or malignant. Patients with benign lesions and large defects were operated for the second time about 2-3 months after the first surgery. Most of the patients with our series small defects did not prefer reconstruction.

CONCLUSION

Osteolytic skull lesions, whether benign or malignant, are amenable to surgical resection. Meticulous radiological evaluation and surgical planning and using multidisciplinary approach is mandatory to ensure low morbidity and mortality.

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