

LIMB SALVAGE SURGERY IN MUSCULOSKELETAL TUMOURS, & MANUFACTURING AND USE OF PAKISTANI CUSTOM MADE TOTAL HIP AND TOTAL KNEE JOINTS

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ABSTRACT

6 cases of tumours of musculoskeletal system, Osteogenic sarcoma (2), Fibrosarcoma (2) Recurrent Giant Cell Tumour (1) and Chondrosarcoma (1); treated with local resection and local reconstruction by us are reported. The experience of using neoadjuvant chemotherapy and radiotherapy in Osteosarcoma and Fibrosarcoma is highlighted. The manufacturing of custom made total knee joint with upper half of tibia (1 case) and total hip joint with upper half of femur, (2 cases) and their use is reported. In this study all parts of these joints were manufactured in Lahore out of imported material.

INTRODUCTION

Limb salvage operations have become safe and viable alternatives to amputations for many patients with bone tumours. Recent advances in neoadjuvant and adjuvant chemotherapy and radiotherapy for chemo and radio-sensitive tumours, improved surgical techniques for both types (chemo and radio sensitive and resistant) of tumours. Reconstruction of the defects created after tumor excision includes custom-made prosthesis (Bradish, c.f., et al 1987) allografts, (Mankin H.J. et al, 1987; and Manaymn W, Malinin, T.I., et al (1985) Vascularized and conventional autografts (Enneking W.F. 1987; Kumar V.P., et al

1988) and Rotation Plasty (Kotz, R. et al, 1988).

A patient's age, life style, and personal wishes can often be accommodated. Surgeons must have familiarity with several types of reconstruction and choose the operation that most appropriately fits the patient's requirements. (Brown K.L.B. 1991)

Before resection tumours like Giant cell Tumour or Chondrosarcoma do not require any specific treatment, however, Osteogenic Sarcoma, and Fibrosarcoma has shown tumor necrosis and fibrosis after administering chemo therapy and radio therapy. (Bacci, G. et

al 1991). Preoperative chemotherapy in itself has facilitated and promoted limb salvage surgery. Winkler K, et al, 1991).

To reconstruct the segment lost by Tumour excision with the help of custom designed or individually designed implants is not a new idea.

Use of the first custom made total hip prosthesis designed and manufactured in Pakistan was reported by Awais, S.M. and Naseer M.A. (1990). Since then authors have designed and manufactured more custom made total hip and total knee joints for their patients reported in this paper. We have also designed and manufactured these implants for patients of bone tumours treated by other orthopaedic surgeons in different cities of Pakistan.

Following are the reports of the cases included in this paper.

CASE 1

18 year old male presented with pain & swelling of upper end of rt. tibia. X-ray were suggestive of osteosarcoma. Biopsy was taken and tumor was confirmed. Arterial catheter was passed into the femoral artery and inj Adriamycin 30 mg diluted in 1000 cc normal saline was pushed through the catheter slowly dialy for three consecutive days. (Total dose of Adriamycin 90mg administered over 3 days. After completion of this treatment catheter is removed. 180 CGY radiotherapy was given locally to the tumor twice daily for 10. days (Total dose $180 \times 2 = 360 \times 10 = 3600$ CGY).

During this time measurements were taken total knee joint with upper half of tibia was designed and manufactured.

A week after the completion of the radiotherapy surgery was undertaken. Blood was exanguinated, tourniquet applied and resection of upper half of tibia along with periosteum and some soft tissues was excised in one piece. Wound packed, tourniquet removed and haemostasis secured.

At this stage drapping of the limb was revised and instruments replaced to perform second part of the operation. (Insertion/Fixation of the custom made total knee). After bleeding was controlled tourniquet was re-ap-



Fig. 1. Showing Growth (Osteosarcoma) of Upper Tibia. Medullary cavities of Femur and Tibia were reamed and prosthesis fixed.

According to the recommendations made by Dubousset J. et al (1991) the prosthesis was covered by Local Muscle Flaps of soleus and gastroc medial heads. Suction drain was placed in and wound closed. 7 days after the surgery patient was mobilized out side the bed with the help of the crutebes. Pt was prescribed 5 more courses of I/C chemotherapy (Adriamycine and Methotrezate) and handed over to the department of oncology (Fig. 1a-h).

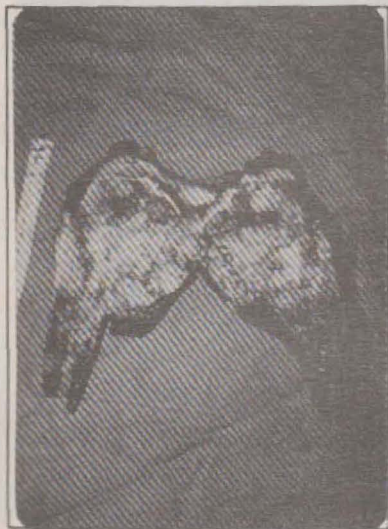
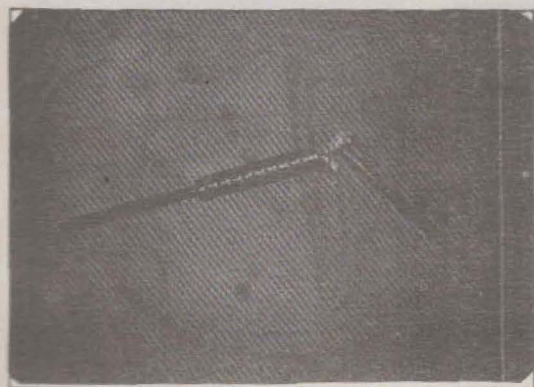


Fig.1. Showing Case 1 (b) Resected Tumor



← Fig.: Showing Case 1: (c) Total Knee



Fig. 1: Showing Case 1 (d) Per Operative Fig.



Fig. 1: Showing Case 1 (e) Per Operative Fig.

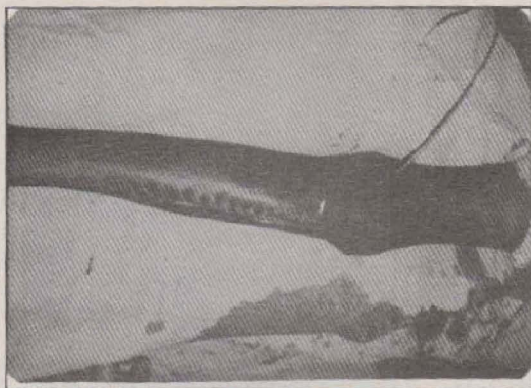


Fig.: Showing Case 1 (f) After Fixation wound closure



Fig 1 Showing Case 1 (h) Patient Mobilized after Surgery

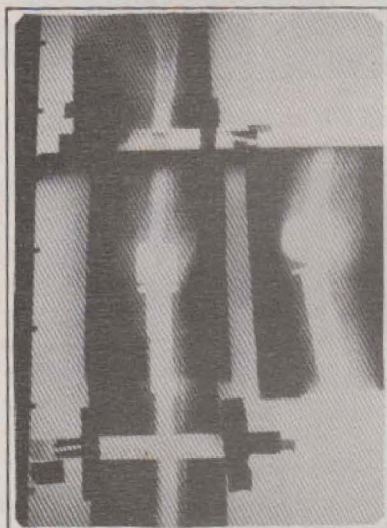


Fig.1: Showing Case 1 (g) X-rays after Surgery

bone graft. The Ipsilateral fibula was shifted medially and fixation performed with the help of the K-wire and a screw. Plaster of paris cast was applied (Fig.2a, b).

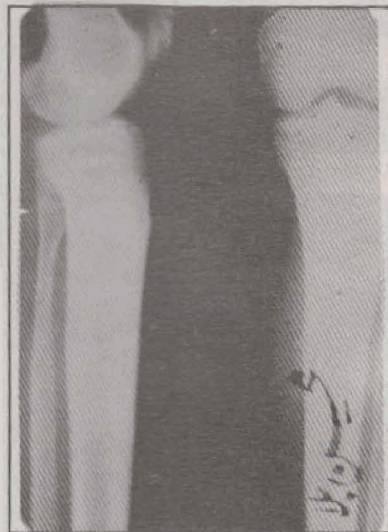


Fig.2: Showing Case 2 a) Pre-Operative X-rays

CASE 2

24 year old male presented with pain + swelling upper tibia. Diagnosis of osteosarcoma was confirmed by histopathological examination of the biopsy taken. Intra arterial catheter was passed, chemo and radio therapy given as in Case 1 and surgery undertaken.

In this case the defect was filled by taking contra-lateral free fibula as

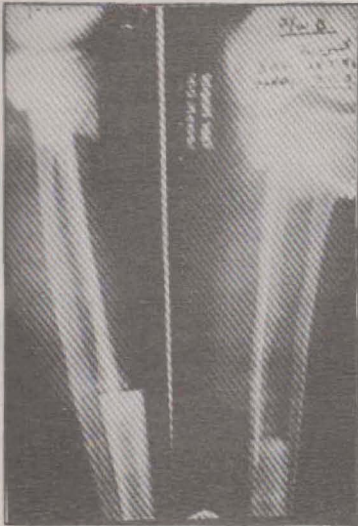


Fig.2: (b)
Post
Operative
X-rays

lower thigh. Histologically both were fibrosarcomas. In both cases intra-arterial catheters were passed and chemotherapy and radiotherapy administered. One week after completion of radiotherapy local resections of tumors were carried out, patients were discharged after removal of sutures and referred to oncology department for subsequent 5 courses of methotrexate and adriamycin every four weeks (Fig.3a-f and Fig.4a,b).

CASE 3 AND 4

A young 36 year old male from Lahore and 28 years old female from



Fig.3: Showing Case 3 (a) X-rays showing size of the Tumour

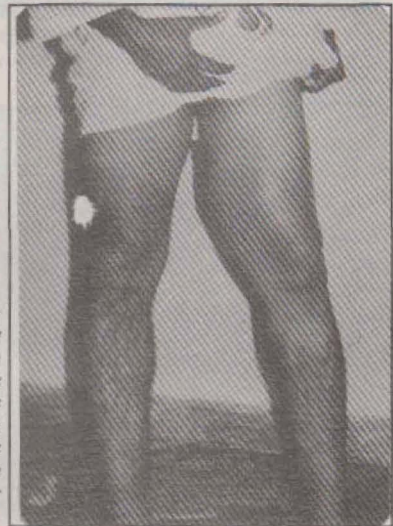


Fig.3:
Showing
case 3 (c)
Pre
Operative
Photograph
of the
size
of the
Tumour



Fig.3: Showing Case 3
b) Administration of Pre operative
Intra-Arterial Adria-Mycine

Northern districts of Pakistan presented with pain + swelling on the back of

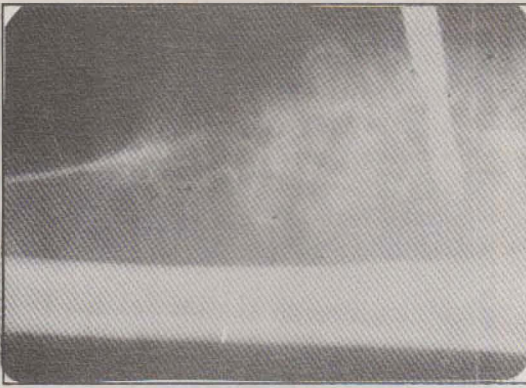


Fig.3: Showing Case 3 (d) Radio-Opaque Dye Confirms the Level of Drug Release. KnifeBlade shows upper limit of Tumour Clinically

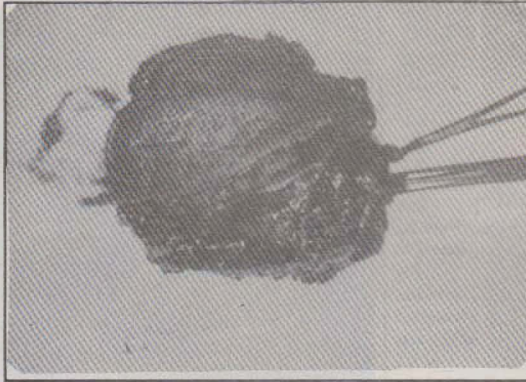


Fig.3: Showing Case 3 (e) Tumor after Resection

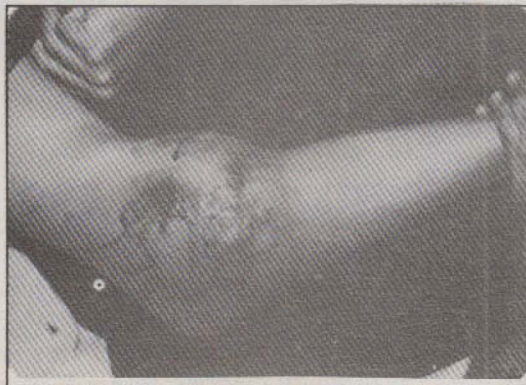


Fig.4: Showing Case 4 (a) Pre Operative Photograph

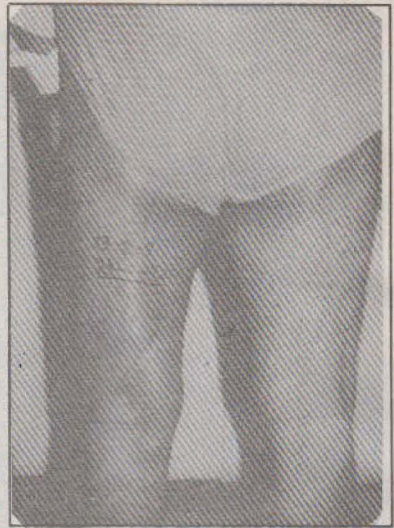


Fig.3: Showing Case 3 (f) Photograph 15 Months after Surgery taken 6 months ago



Fig.4: Showing Case 4 (b) Per Operative Photograph

CASE 5

A young female 28 year old presented with recurrent giant cell tumor of upper half of the right femur. She had pre-existing pathological fracture which was already

treated in one of other hospitals by curettage and bone grafting.

Measurements were taken with the help of scanograms and CT Scans. Custom made total hip with upper half of the femur were designed and manufactured using 316L stainless steel and acetabular cup using high density, ultra high molecular weight polyethylene Tumor was excised and prosthesis (both acetabular and femoral components) made by us in Lahore were fixed (Fig.5a-g).

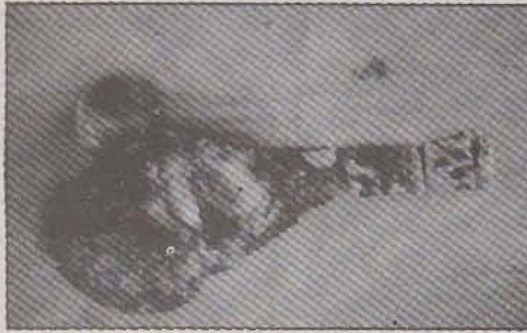


Fig.5: Showing Case 5 (c) Photograph of Excised Tumor. Note Hole in Distal Piece from where Biopsy taken to find out extent of Intra Medullary Tumor Spread

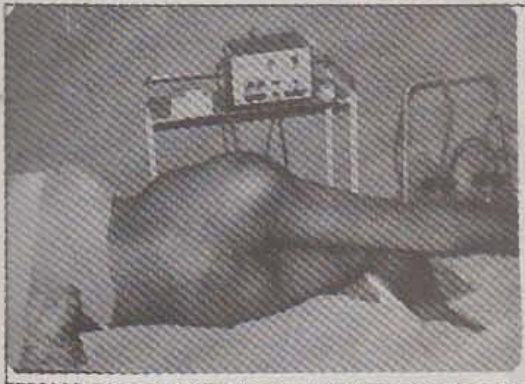


Fig.5: Showing Case 5 (a) Pre Operative Photograph showing Growth of upper end of Femur



Fig.5: Showing Case 5 (d) Showing Section through the Tumor



Fig.5: Showing Case 5 (b) Photograph taken during Per Operative Dissection

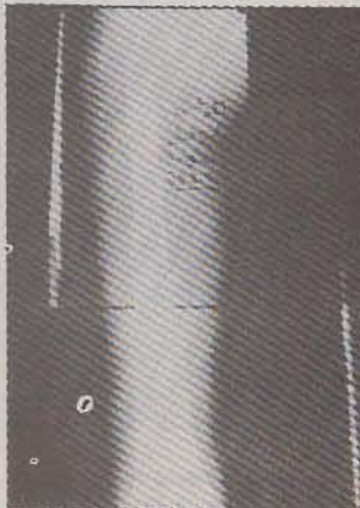


Fig.5(e): Postoperative X-rays showing Custom Made Total Hip



Fig.5: Showing Case 5 (f) Showing Patient Mobilized in the bed on 3rd Post Operative Day



Fig.5: Showing Case 5 (g) Showing Patient Mobilized during Second Week after Surgery

CASE 6

A 42 years old male from district Jhang reported to us with swelling of the trochanteric area of right hip.

Biopsy revealed chondrosarcoma. Measurements were taken and custom made total hip joint was designed and manufactured. Prosthesis was fitted through lateral approach. Pt was mobilized out of the bed on day 4 after the treatment. Pt was discharged 3 weeks after the surgery (Fig.6a-h).



Fig.6: Showing Case 6 (a) X-rays ten months before Surgery showing well localised Tumor



Fig.6: Showing Case 6 (b) X-rays nine months before Surgery showing Pathological Fracture



Fig. 6: Showing Case 6 (c) X-rays one month before Surgery done by the Author

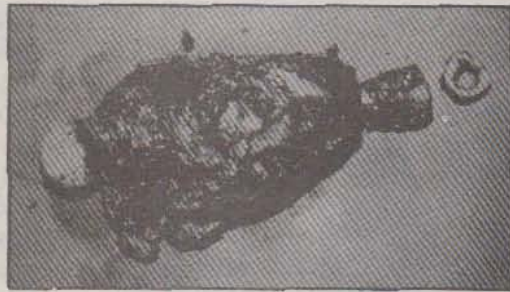


Fig. 6: Showing Case 6 (d) Photograph of Excised Tumor alongwith Head of Femur

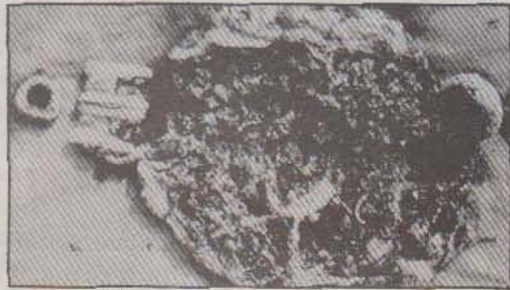


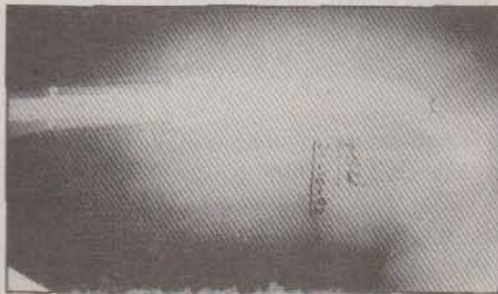
Fig. 6: Showing Case 6 (f) Photograph of Section cut through the Tumor



Fig. 6: Showing Case 6 (e) Photograph taken during the Surgery. Showing Custom made Total Hip in Position



Fig. 6: Showing Case 6 (h) Photograph of Patient Walking with Aid ten days after Surgery



←
Fig. 6(g) Photograph of Post Operative X-rays



Fig 6(h)
Patient in
follow up
Clinic 2
years
after
Surgery

DISCUSSION

Limb salvage surgery in 6 patients is reported. In all 4 sarcomas intra arterial adriamycine and radiotherapy were provided. The dose of radio therapy was based on research made by Gaitan-Yanguas (1981) as cited by Kalnicki S. (1989). In this study gaitan-yanguas analysed the surgical specimens of 18 patients submitted to irradiation followed by Amputation 6 months later. He concluded that dose above 3200 c GY in 10 days or 8000 rods in 60-70 days resulted in tumor sterilization.

During October 1991 meeting of International Society for the study of

custom prosthesis more than 100 scientific papers were presented on various topics of custom designed and manufacturing and their use.

Bleck (1988) raised the possibility that implanted foreign body might induce local malignancy. Apley (1989) invited investigations in this area. No study has come up supporting Bleck's possibility. When development of custom made total hip joint was reported, (Awais and Naseer, 1990), imported acetabulum cup was used. In present study acetabulum cups used have been manufactured locally.

For designing custom made total knee or total hip, measurements of normal + diseased bones by CT has proved most useful. In our setup fear of infection is sometime the major factor which prevent under taking of major surgical procedures. Authors recommed use of ultra violet light in the operating rooms.

Use of neoadjuvent chemo-and radio therapy for sarcomas has improved the disease free survival rate. In present study treatment protocol of Eilber FR et al, (1975) has been followed (90mg Adrimy-cine intra-Arterial in 3 days with 3500 CGY radiotherapy in 10 - 20 fractions, followed by resection. Kalnicki S, (1989) longest follow up of patient in present series is 2 years.

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