Radical Resection of the Distal Humerus and Prosthetic Reconstruction

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Purpose

- To describe the indications, surgical technique, and short term oncological and functional results for radical resection of the distal humerus and prosthetic reconstruction
- Small series of 3 patients
Indications for this Procedure

- Primary bone sarcoma of the distal humerus
- Primary soft tissue sarcoma surrounding or invading the distal humerus
- Palliation for advanced metastatic carcinoma with severe bony destruction
- Complications related to conservative treatment for pathological fractures (nonunion or progression following radiation)
Cases

- 52 year old male with a 9 cm high grade synovial sarcoma arising from the proximal flexor-pronator mass, surrounding the distal humerus
- 54 year old female with advanced metastatic renal cell carcinoma involving the distal humerus and a useless, painful arm/elbow; treated one year prior with intramedullary rods at another institution
- 55 year old male with myeloma and a pathological fracture of the distal humerus who failed treatment with radiation and had a persistent nonunion treated conservatively for 4 months
Surgical Procedure--Steps

- **Tumor resection**
  - Dissection and mobilization of brachial vessels
  - Dissection and Preservation of median, radial and ulnar nerves
  - Preservation of biceps
  - Preservation of sufficient forearm flexors and extensors while still maintaining an adequate margin

- **Prosthetic reconstruction with Modular Segmental Distal Humerus and Total Elbow**

- **Soft tissue reconstruction**
  - Proximal transfer/rotation of forearm flexors and extensors with elbow flexed 60-90 degrees (Flexorplasty)
  - Biceps tensioned appropriately; Side sutured to triceps for full closure
  - Entire prosthesis must be covered with soft tissue
Case 1

- 52 year old male with high grade synovial sarcoma arising in the elbow region
- Large incisional biopsy in another country
- Preoperative chemotherapy
- Postop radiation
MRI—Large Mass Surrounding Distal Humerus
Arteriogram to Visualize blood Vessels
Case 2

- 54 year old female with advanced metastatic renal cell carcinoma involving the distal humerus
- Failed previous intramedullary fixation and radiation
- Presented with a 10 cm mass
Distal Humerus Destroyed by Tumor
Arteriogram Showed a Hypervascular Mass
Preoperative Embolization to Cut Off Blood Supply to Tumor
Case 3

- 55 year old male with a nonunion of a pathological fracture of the distal humerus for 4 months
- Failed previous radiation
- Poor quality bone at time of surgery—not appropriate for internal fixation
Metastatic Renal Cell Carcinoma
Incision--Anteromedial
Biceps Muscle
Neurovascular Dissection and Mobilization

Feeding Blood Vessels to Tumor are Tied Off

Biceps Muscle

Brachial Vessels

Median Nerve
Ulnar Nerve

Tumor Covered by Brachialis Muscle

Ulnar Nerve
Specimen Metastatic Renal Cell
Defect

- Ulnar Nerve
- Median Nerve
- Brachial Vessels
- Radial Nerve
- Olecranon
- Median Nerve
- Brachial Vessels
- Ulnar Nerve
Modular Segmental Replacement with Constrained Hinged Total Elbow
Implantation of the Prosthesis
Synovial Sarcoma of Elbow
Specimen
Tumor Wrapped Around Distal Humerus
Brachialis Muscle Involved by Tumor
Defect

- Olecranon
- Remaining Humerus
- Biceps Muscle
- Median Nerve/Brachial Vessels
- Ulnar Nerve
- Radial Nerve
Prosthesis Inserted
Elbow Flexion
Flexorplasty of Forearm Muscles to Biceps
Epidural Catheter into Brachial Plexus for Bupivicaine Infusion
X-Rays AP
Results

- Patients are maintained in a brace in flexion of 60 – 90 degrees for 6 weeks then active motion exercises are initiated.
- Patients were followed for 6 months to 14 months.
- No local recurrences.
- All patients had functional use of their hands postoperatively.
- Pain was relieved in all patients.
- Active ROM of Elbow was 10-90 degrees by 16-20 weeks postoperatively.
- No neuropraxias.
- 1 minor wound dehiscence treated successfully with local dressing changes.
12 Weeks Postop Metastatic Renal Cell
16 Weeks Postop Synovial Sarcoma
Reconstruction of the distal humerus with a cemented modular segmental distal humerus / constrained total elbow prosthesis is a safe and reliable method for reconstruction following radical resection of selected tumors for palliation or cure.

Function is optimized with soft tissue reconstruction and multiple muscle rotation flaps.

It is an acceptable alternative to an above elbow amputation or shoulder disarticulation.

Pain relief is reliable and a functional hand and elbow can be restored.

Complications can be minimized with careful attention to neurovascular dissection and soft tissue reconstruction.

The survival of the prosthesis awaits long term results.
Thank You!!
Nonunion of Pathological Fracture of Distal Humerus after Radiation Treatment