GIANT CELL TUMOUR

DR RAJAT GUPTA

ORTHOPAEDIC ONCOLOGIST

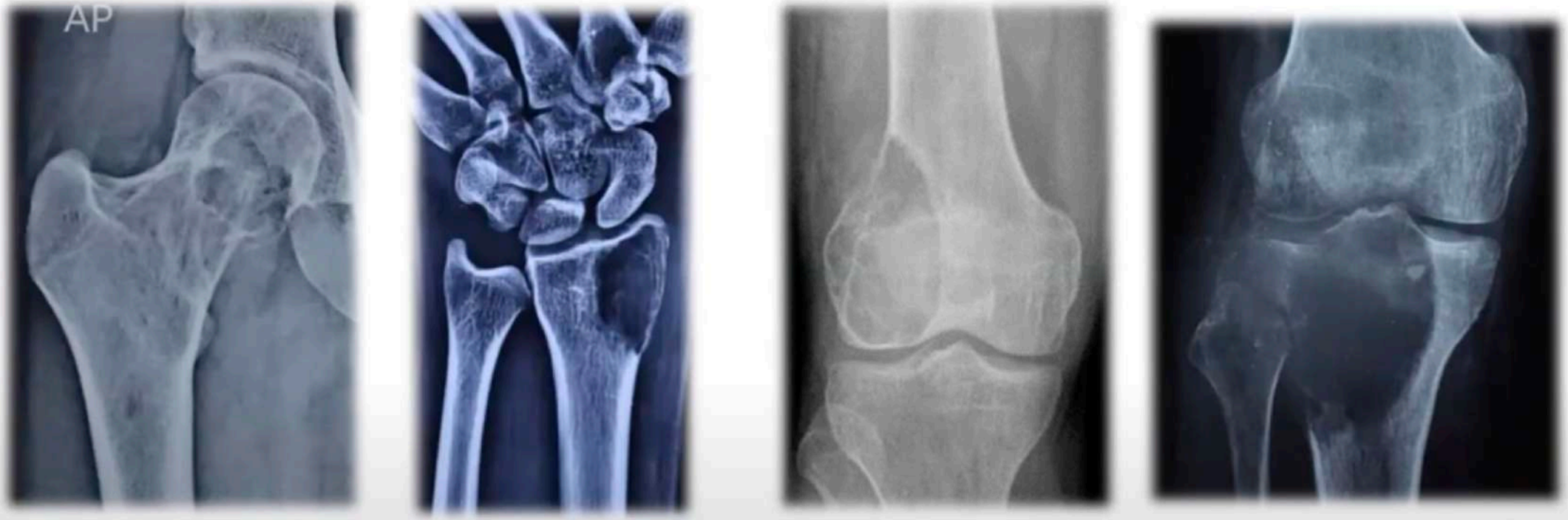
BONE CANCER CLINIC

CHANDIGARH

www.curebonecancer.com

+91-9930372264

GIANT CELL TUMOUR

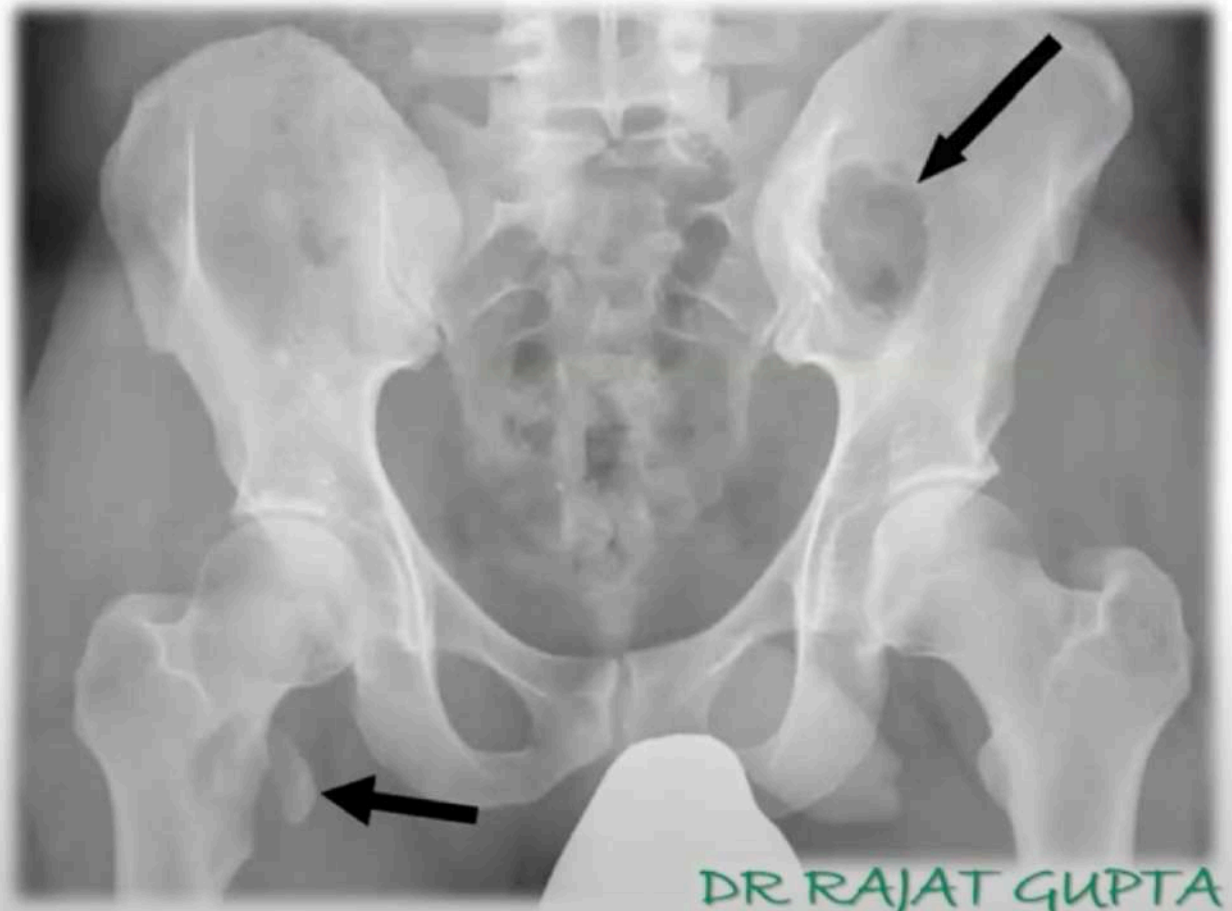


- CAN AFFECT ANY BONE
- DISTAL FEMUR, PROXIMAL TIBIA, DISTAL RADIUS MOST COMMONLY INVOLVED IN THAT ORDER

GIANT CELL TUMOUR

- CAN BE MULTICENTRIC IN 2% OF THE CASES

  - Synchronous
  - Metachronous



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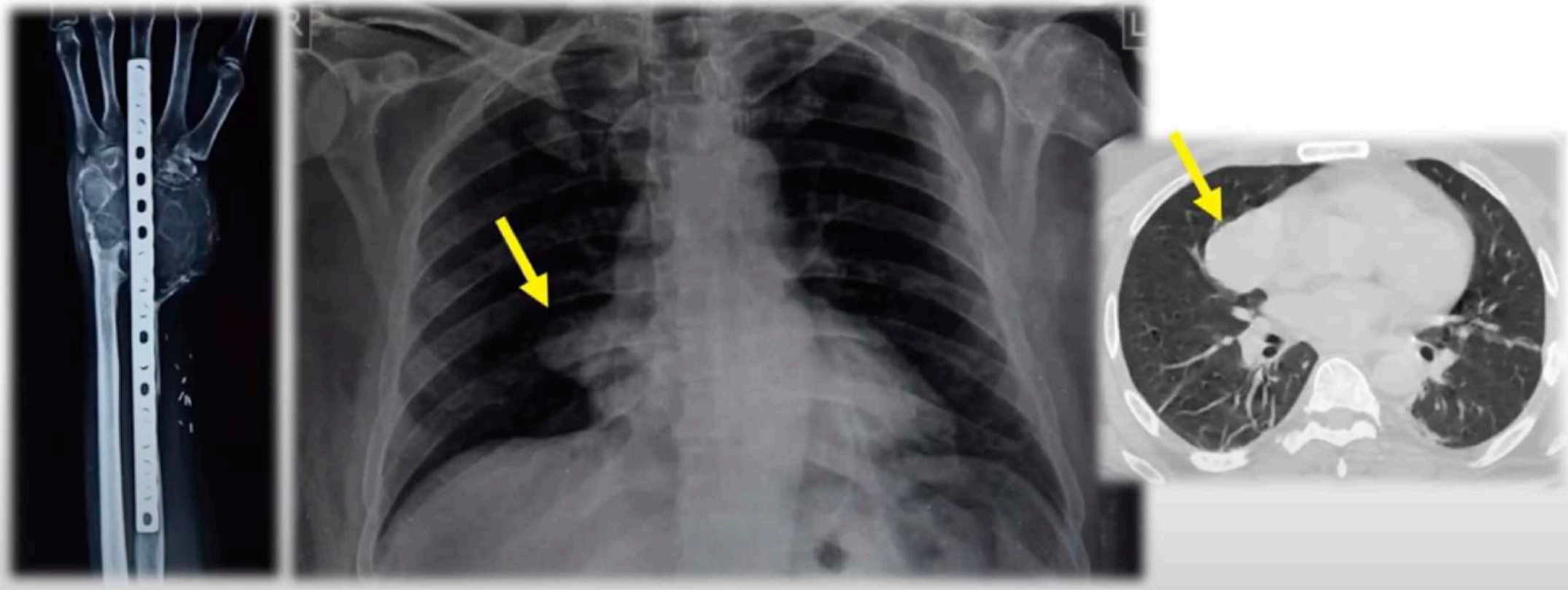
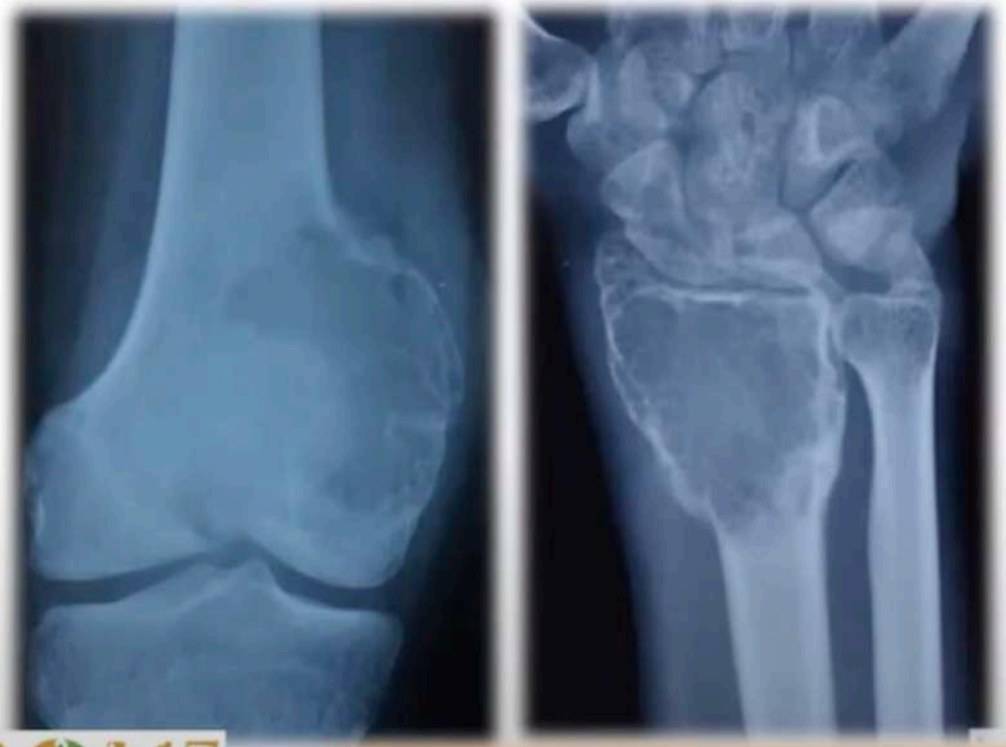
GIANT CELL TUMOUR

2% OF THE PATIENTS DEVELOP LUNG METASTASIS



MORE SO IN RECURRENT CASES

GIANT CELL TUMOUR



- AGE *SKELETALLY MATURE*
- LOCATION OF TUMOUR *EPIPHYSEAL*
  METAPHYSEAL IN SKELETALLY IMMATURE
- TYPE OF LESION *GEOGRAPHICAL*
  Eccentric
- MATRIX OF LESION *NO MATRIX*
- ZONE OF TRANSITION *NARROW*
- TYPE OF PERIOSTEAL REACTION *NIL*
- SOFT TISSUE COMPONENT *CAN HAVE*

BONE CANCER CLINIC

ABSENCE OF SCLEROTIC RIM

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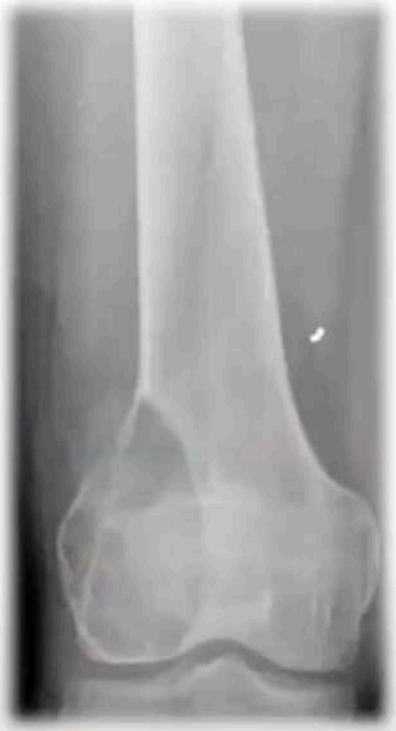
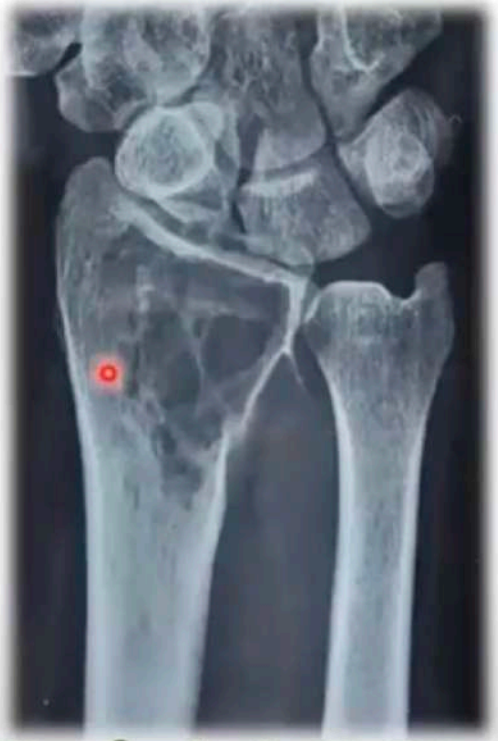
GIANT CELL TUMOUR





SOAP BUBBLE APPEARANCE

BONE CANCER CLINIC

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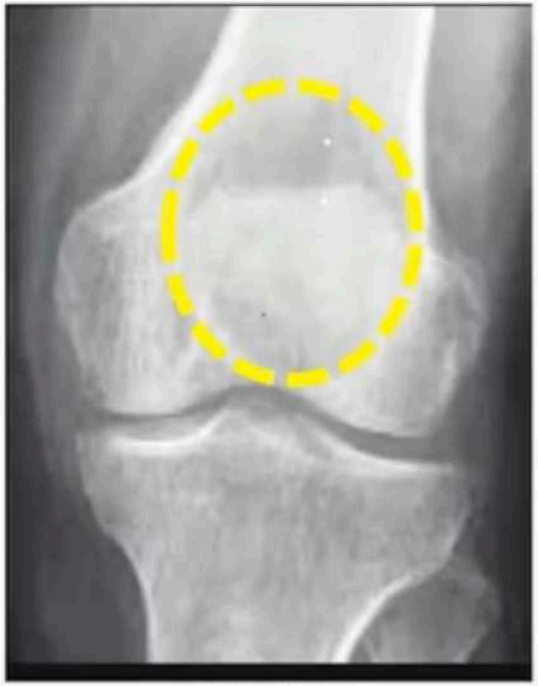
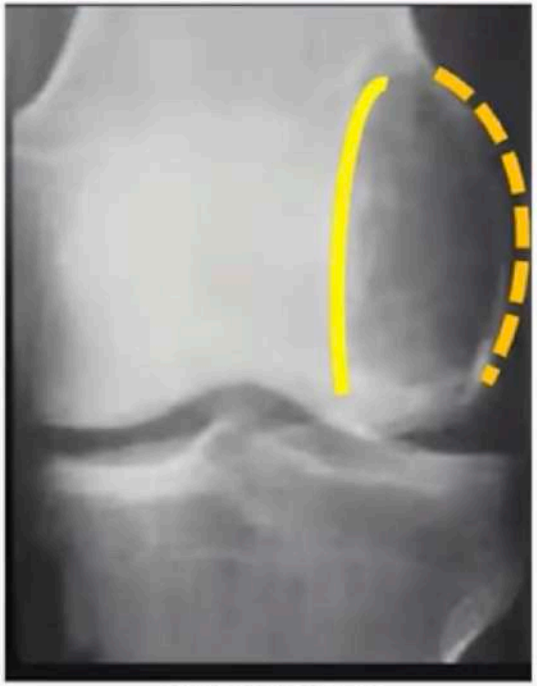
GIANT CELL TUMOUR



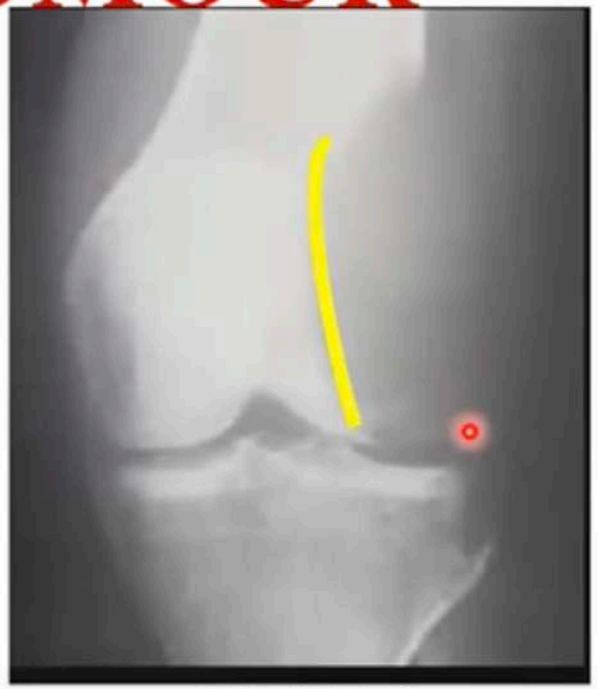
GRADE 1

Well marginated border



GRADE 2

Relatively well defined margins
Expanded but intact cortex



GRADE 3

Cortex is broken with soft tissue component

Campanacci grade

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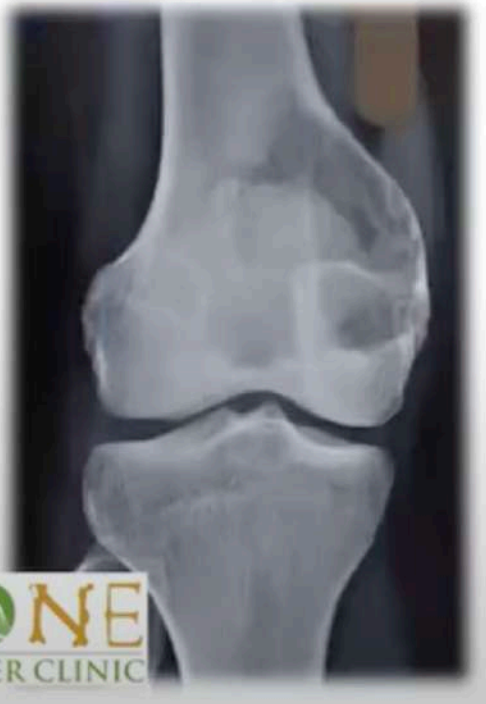
TARGET ORTHO

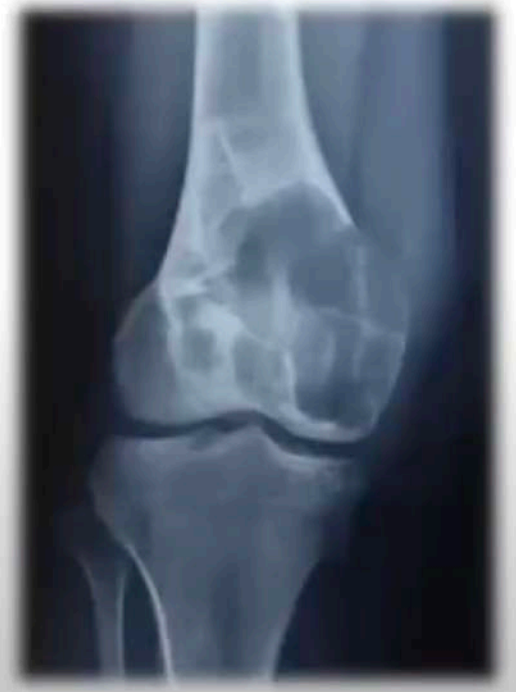
GIANT CELL TUMOUR

DIFFRENTIALS

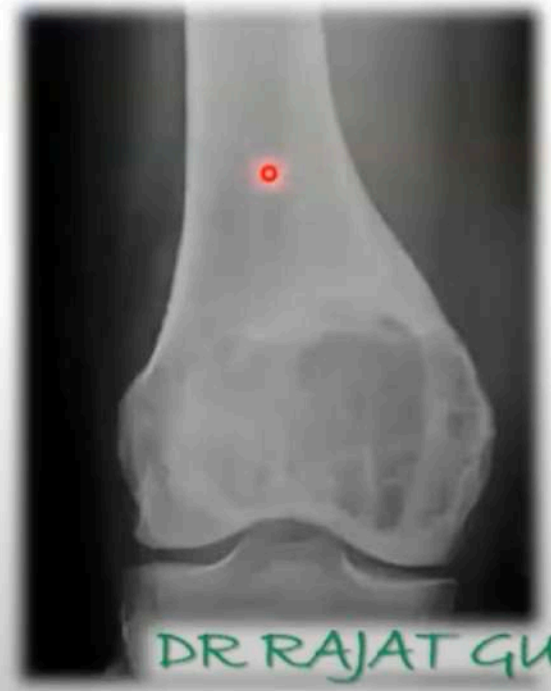
GCT



CLEAR CELL CHONDROSARCOMA



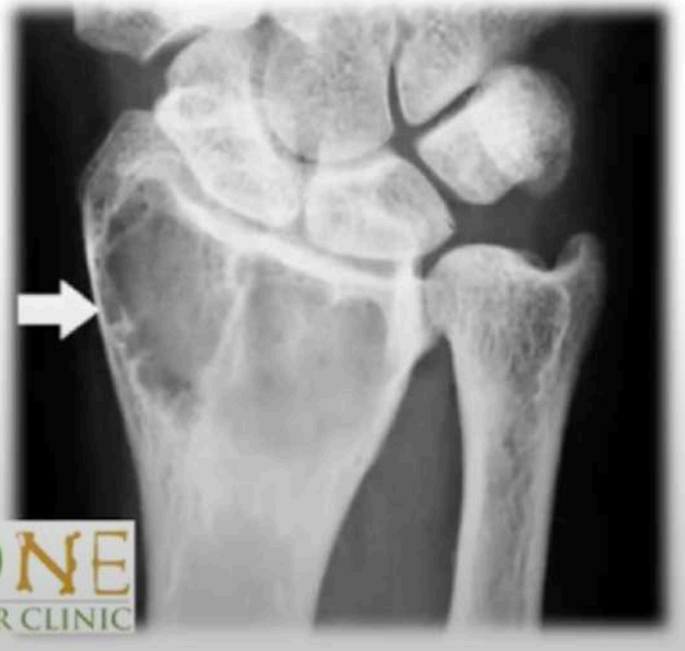
CHONDRO BLASTOMA



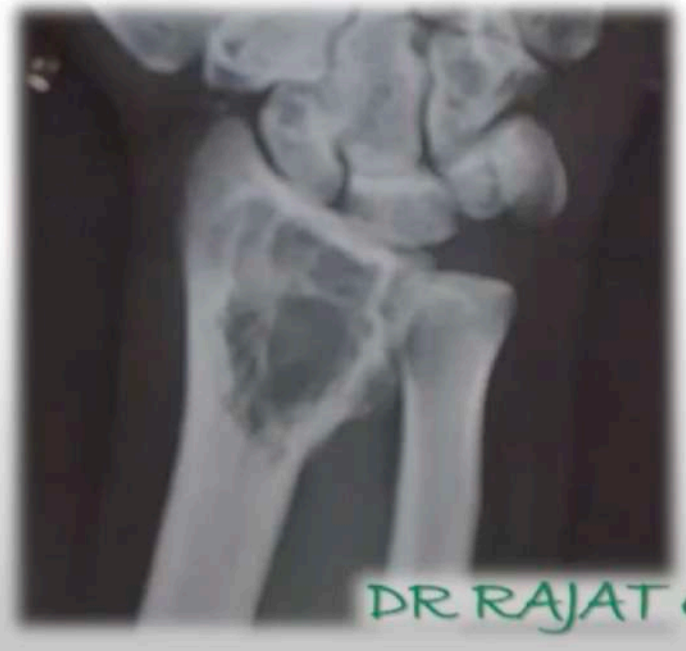
GIANT CELL TUMOUR

DIFFRENTIALS

BROWN'S TUMOUR



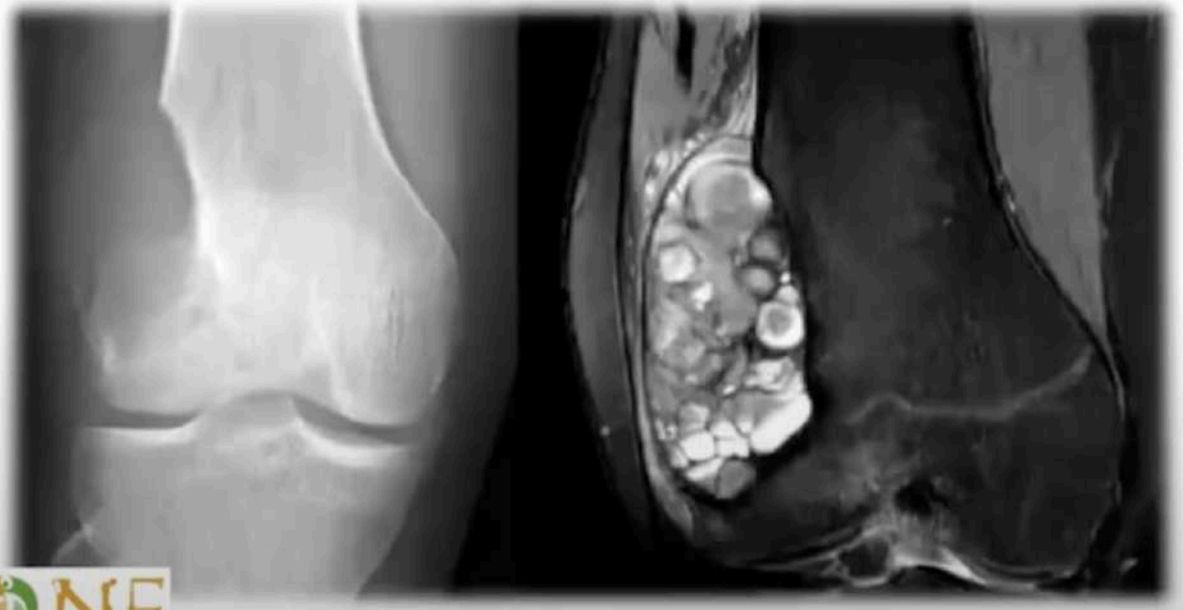
GCT



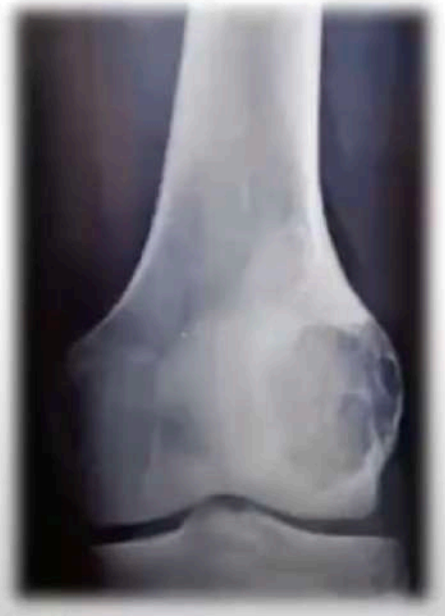
GIANT CELL TUMOUR

DIFFRENTIALS

GIANT CELL RICH OSTEOSARCOMA



GCT



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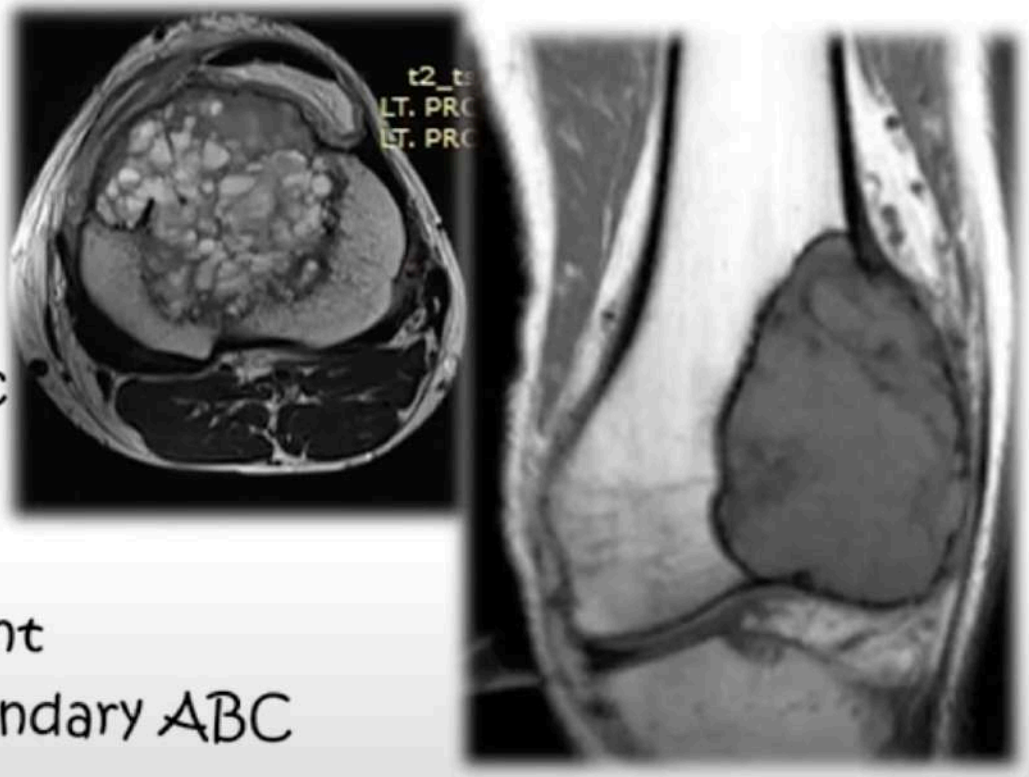
GIANT CELL TUMOUR

WORK UP

MRI

- Epi-metaphyseal region, eccentric
- T1 – Hypointense
- T2 – Hyperintense/ Mixed
- Can have extraosseous component
- Can have Fluid fluid level – Secondary ABC component



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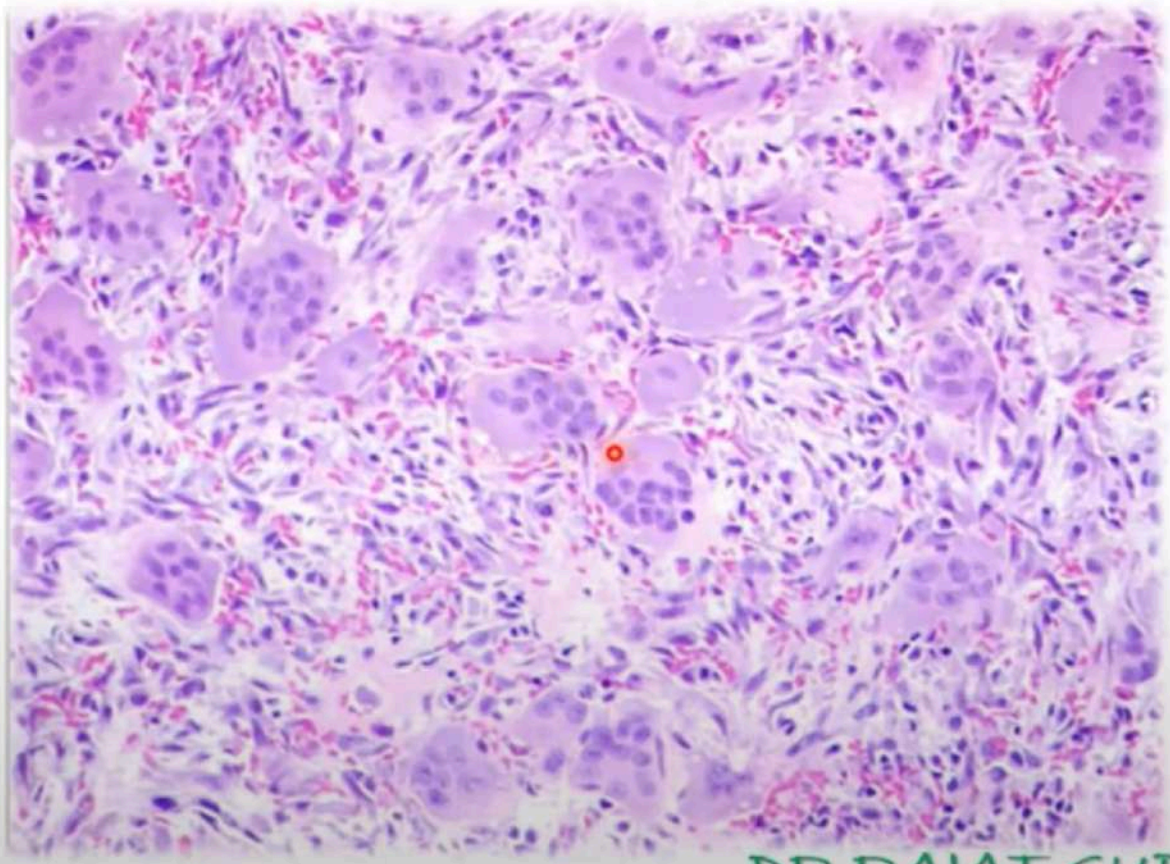
GIANT CELL TUMOUR

WORK UP

BIOPSY

GIANT CELL RICH LESION IS NOT SYNONYMOUS WITH GIANT CELL TUMOUR OF BONE



BONE CANCER CLINIC

GIANT CELL TUMOUR

TREATMENT

SURGICAL MODALITIES

- **EXTENDED CURETTAGE**
- **RESECTION**

NON SURGICAL MODALITIES

- **ANGIOEMBOLISATION**
- **ZOLENDRONIC ACID**
- **DENOSUMAB**

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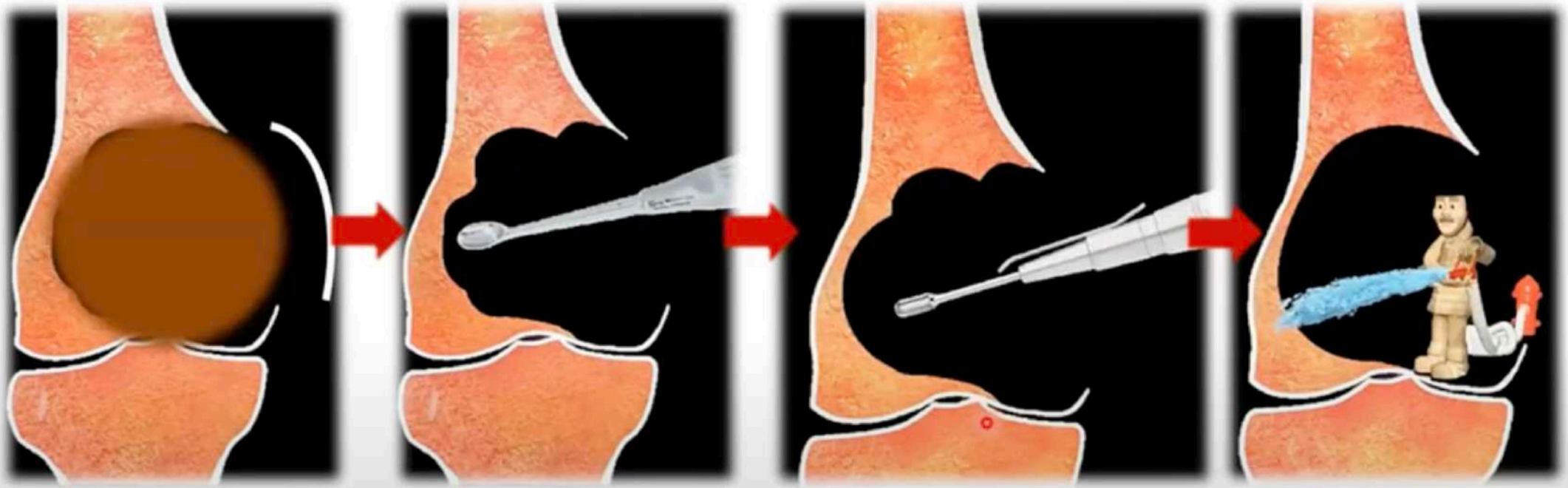
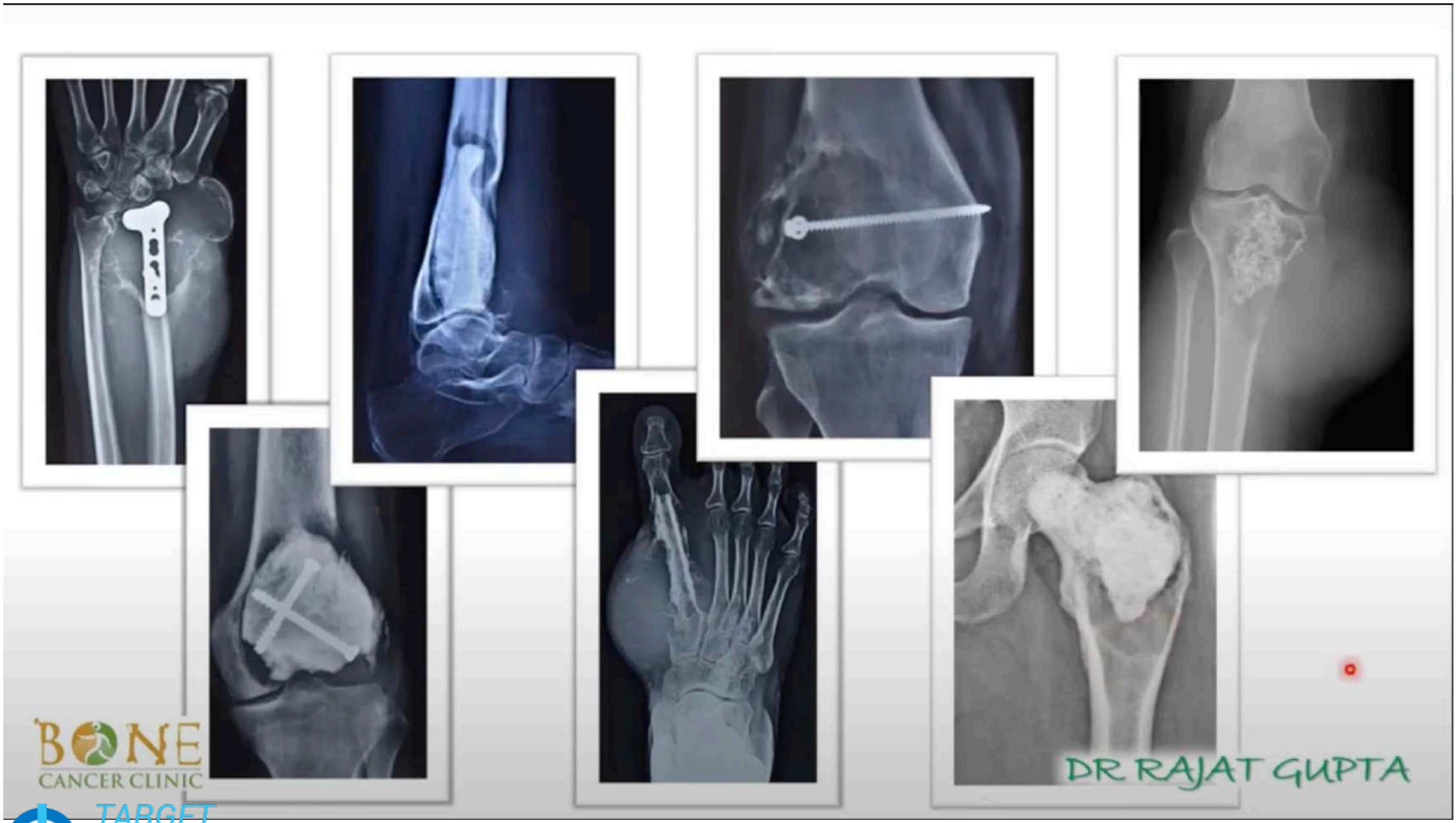
GIANT CELL TUMOUR

CURETTAGE





- POOR CASE SELECTION ?
- POOR TECHNIQUE ?

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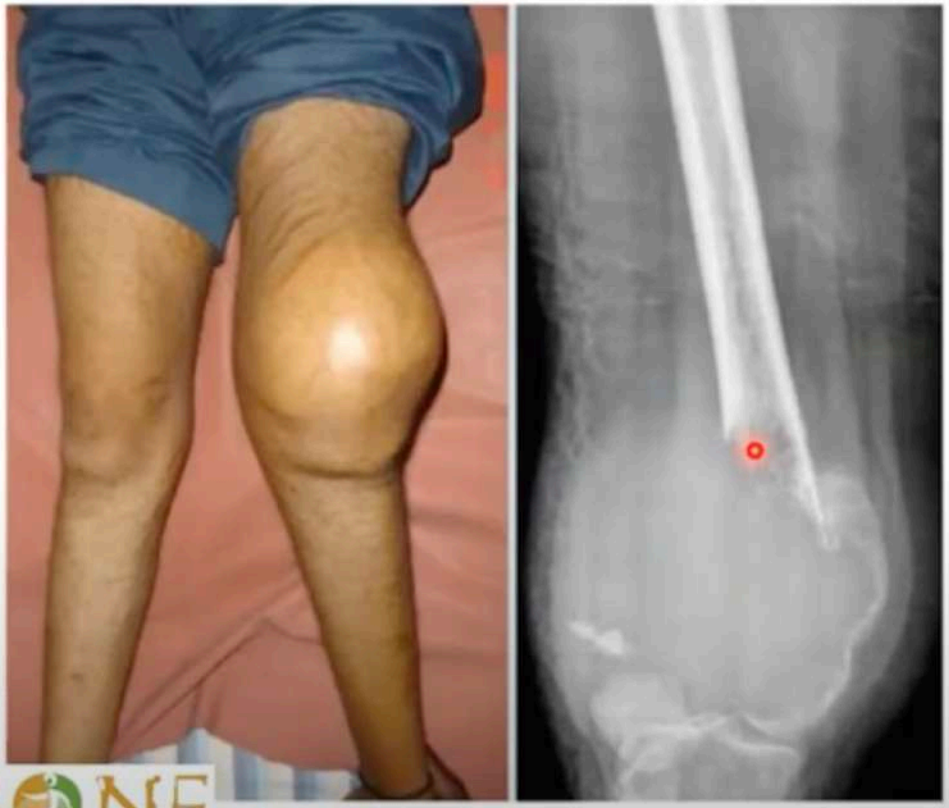
EXTENDED CURETTAGE



BONE CANCER CLINIC

➢ WHEN ?

- Adequate disease clearance is possible
- Good residual bone can be saved

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EXTENDED CURETTAGE

BONE CANCER CLINIC

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EXTENDED CURETTAGE

- HOW ?

BONE CANCER CLINIC

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EXTENDED CURETTAGE

- ADEQUATE EXPOSURE
- CURRETING & BURRING
- ADJUVANTS
- RECONSTRUCTION

BONE CANCER CLINIC

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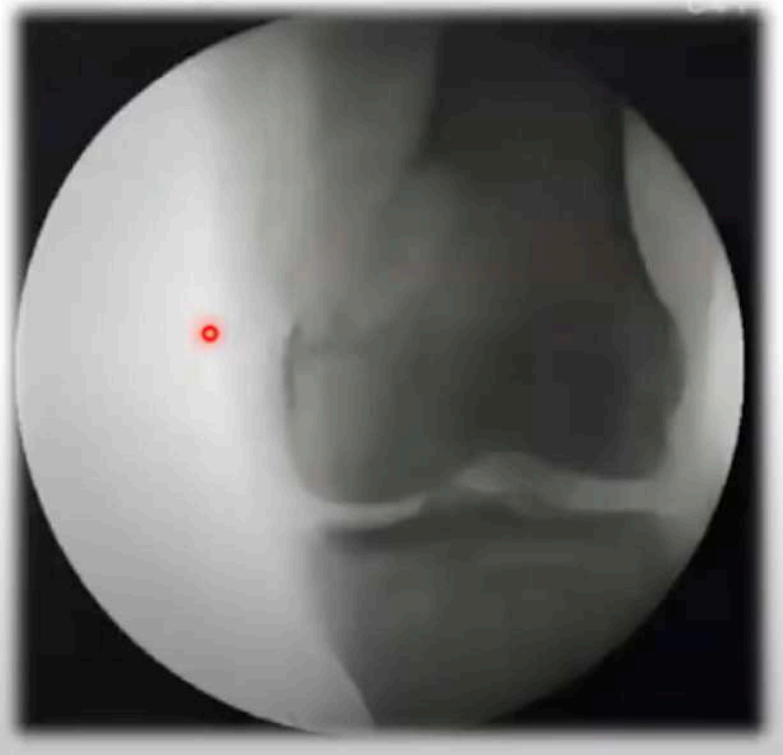
EXTENDED CURETTAGE

ADEQUATE EXPOSURE



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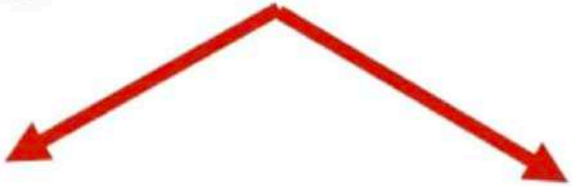
EXTENDED CURETTAGE

ADEQUATE EXPOSURE



SOFT TISSUE EXPOSURE

BONE EXPOSURE

BONE CANCER CLINIC

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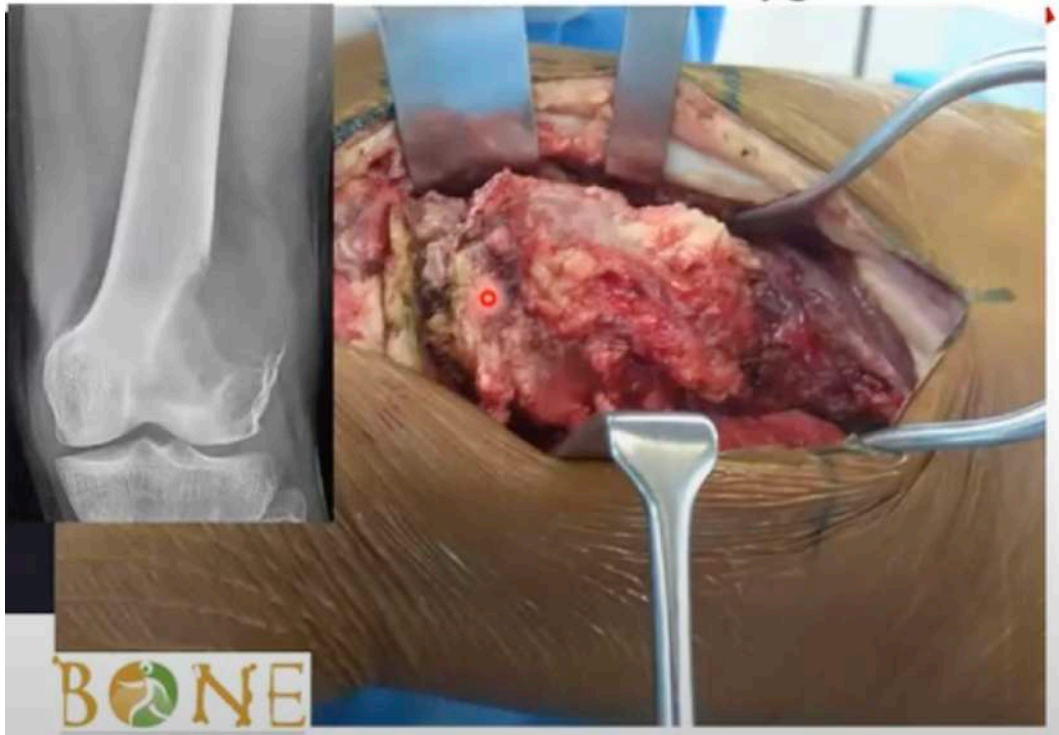
EXTENDED CURETTAGE

ADEQUATE EXPOSURE



- ✓As atraumatic as possible
- ✓Isolate with H_2O_2 mops
- ✓Enbloc removal of soft tissue component
- ✓Cautery

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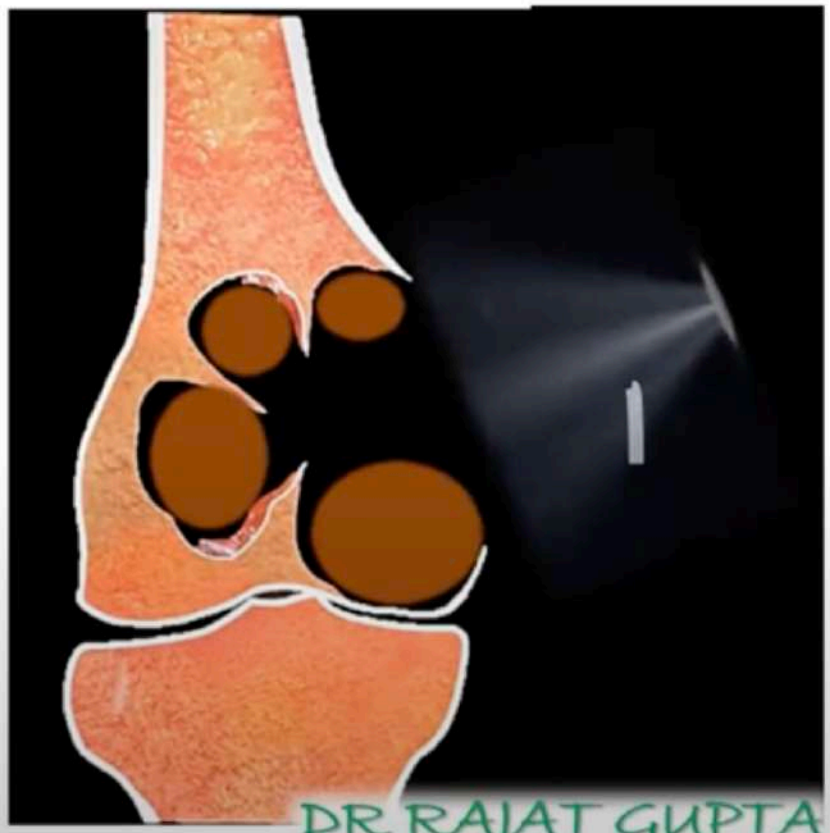
BONE CANCER CLINIC

EXTENDED CURETTAGE

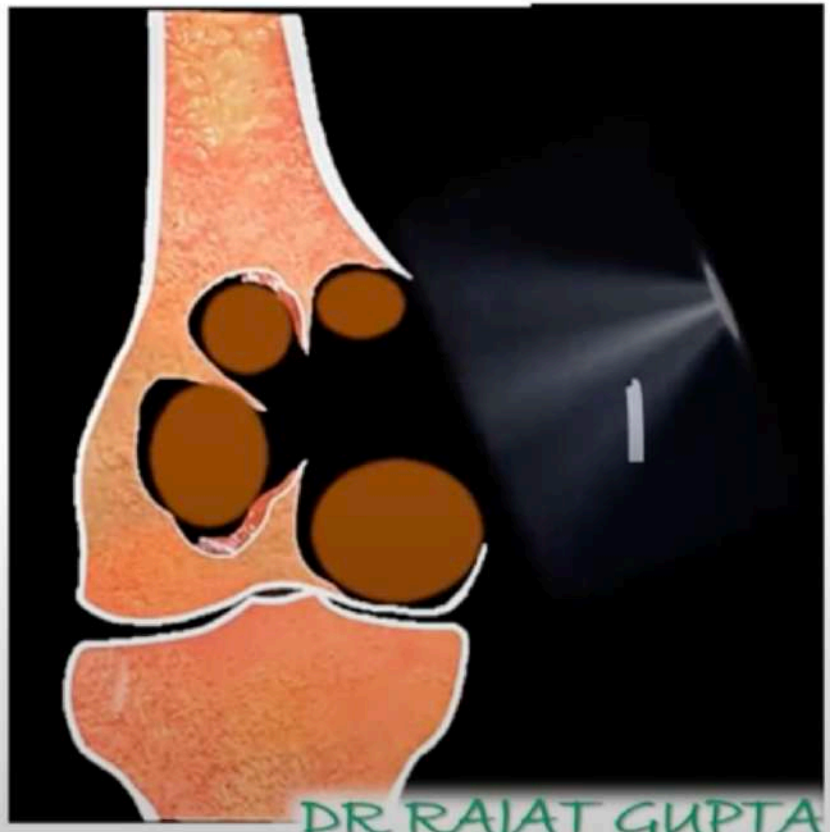
- ✓ Large window



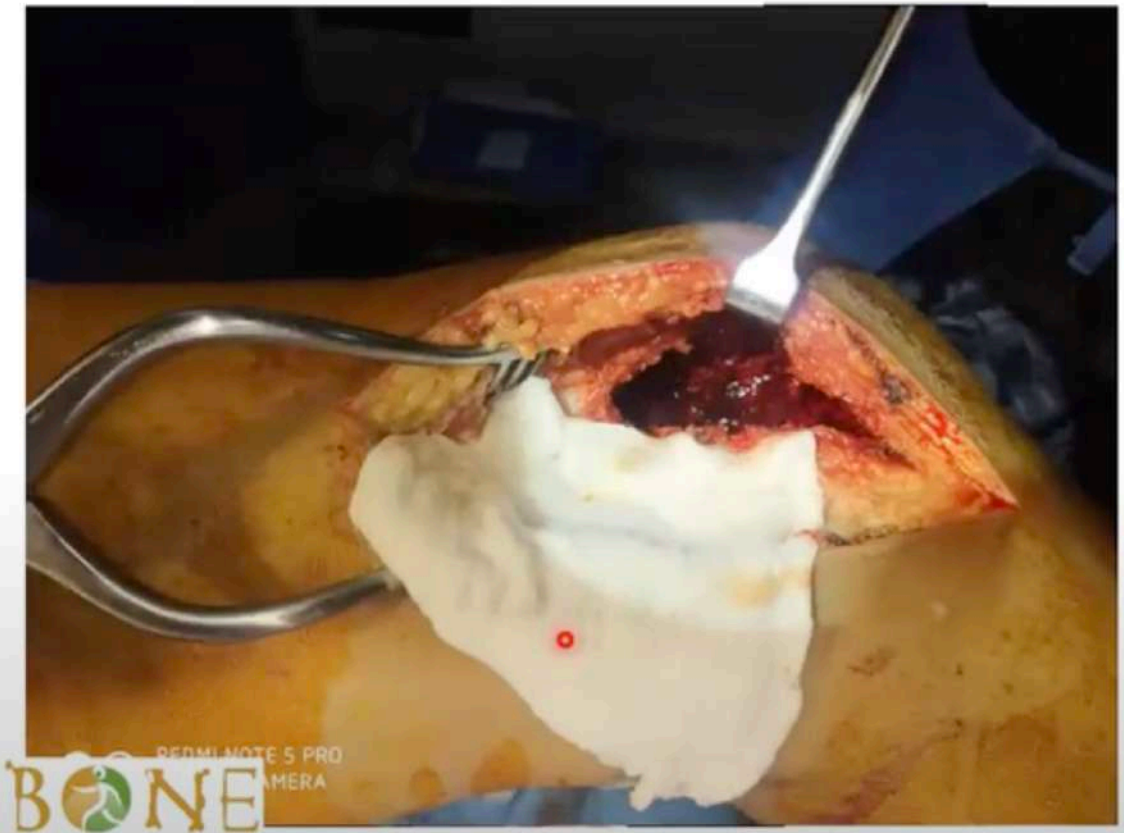
BONE CANCER CLINIC

TARGET ORTHO

EXTENDED CURETTAGE



EXTENDED CURETTAGE



- ✓ Large window
- ✓ Curetting

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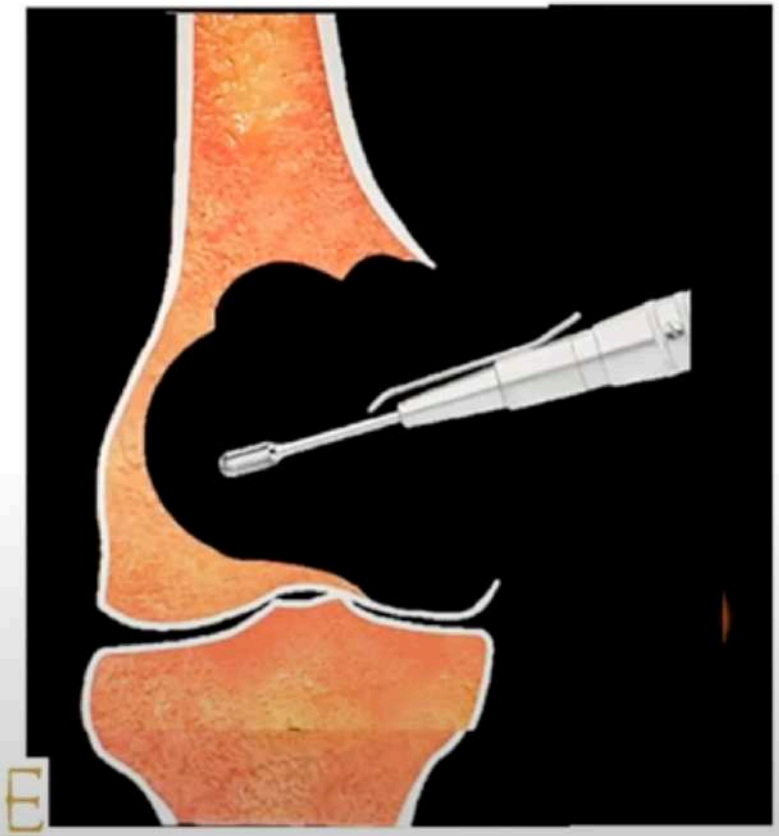
BONE CANCER CLINIC

TARGET ORTHO

EXTENDED CURETTAGE



- ✓ Large window
- ✓ Curetting
- ✓ High Speed Burring

BURRING IS NOT ADJUVANT

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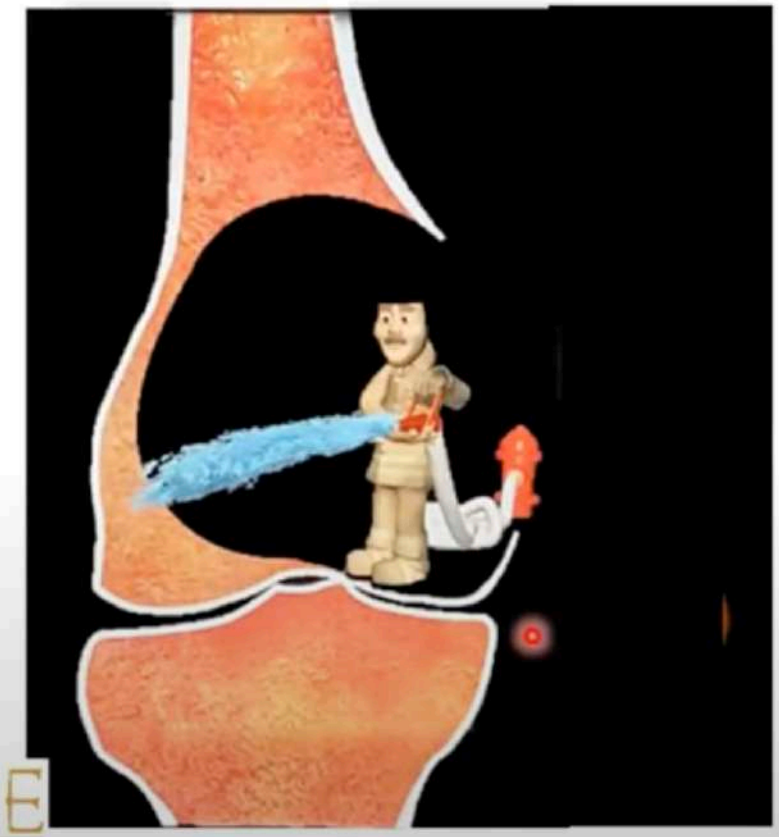
EXTENDED CURETTAGE



- ✓ Large window
- ✓ Curetting
- ✓ High Speed Burring
- ✓ Pulsed Lavage

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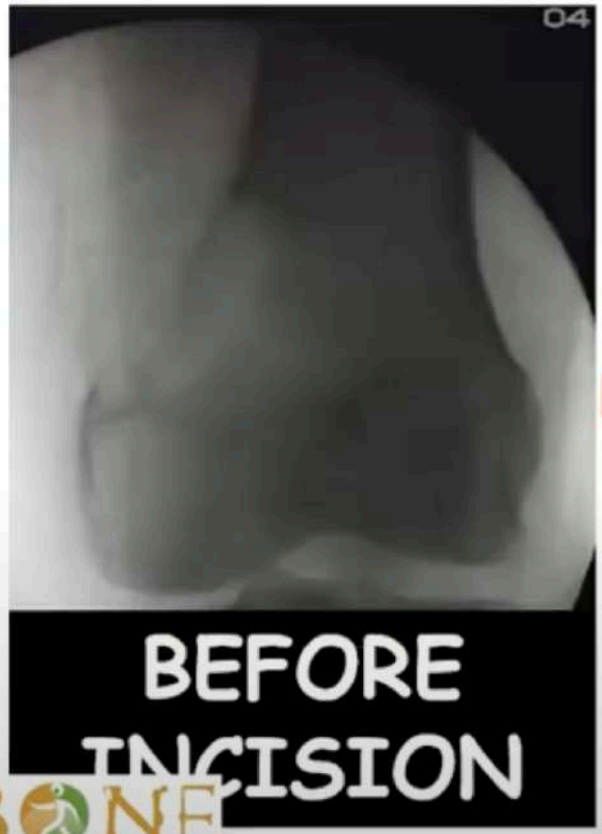
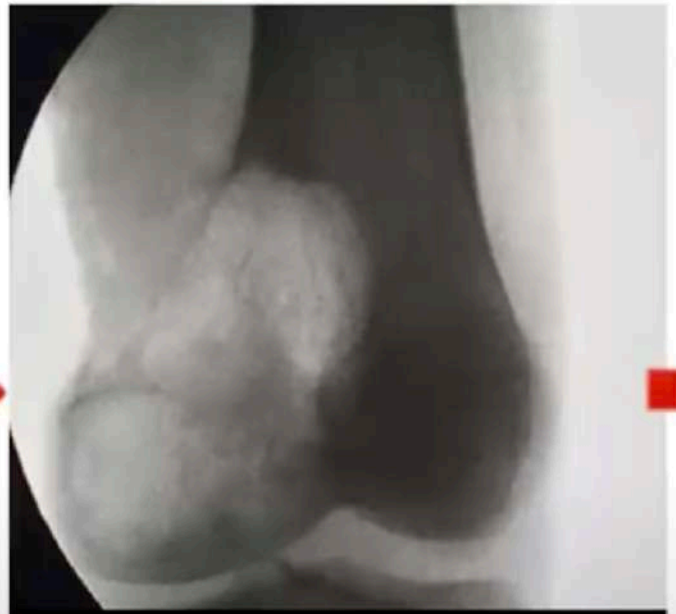
BONE CANCER CLINIC

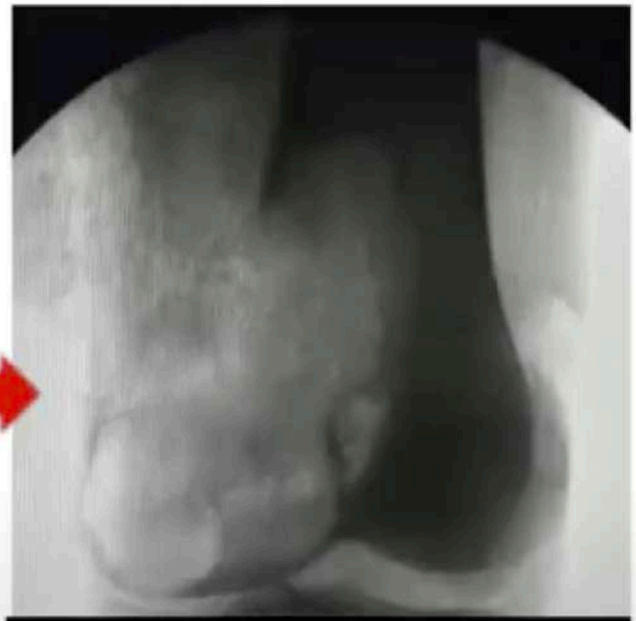
EXTENDED CURETTAGE



BEFORE INCISION



AFTER CURETTING



AFTER BURRING

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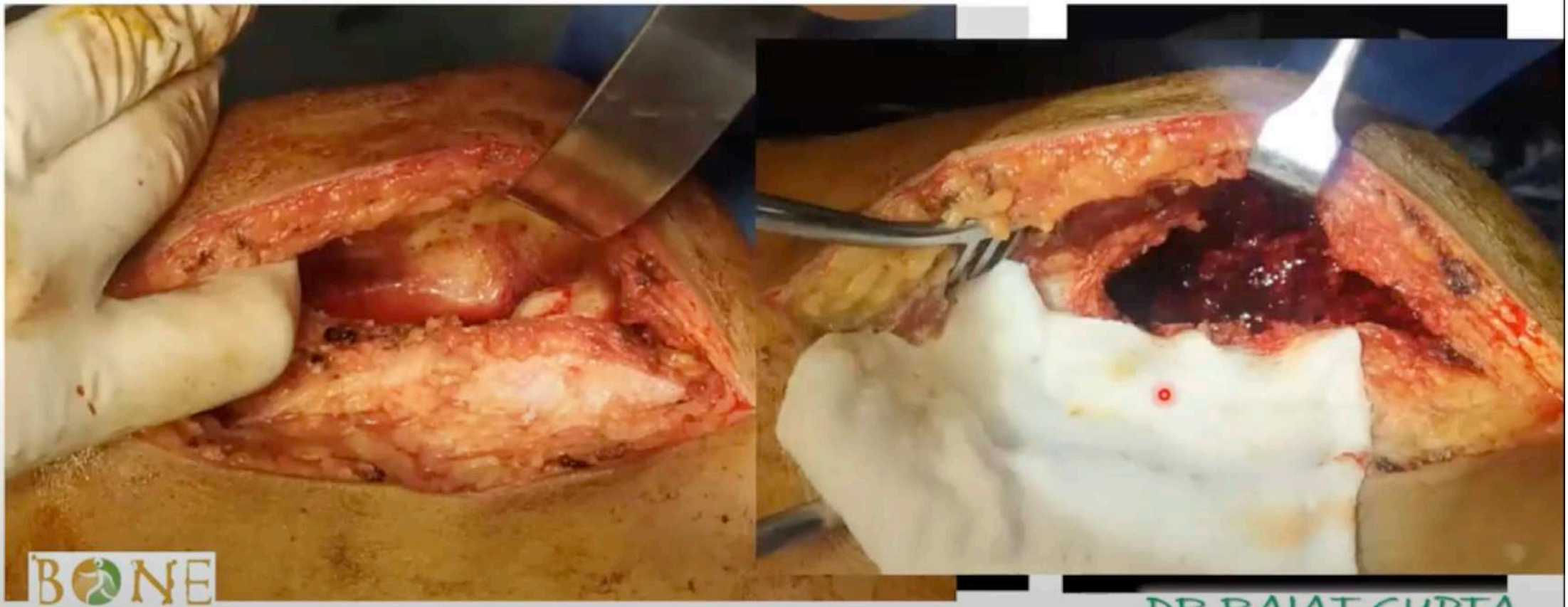
EXTENDED CURETTAGE



GIANT CELL TUMOUR

EXTENDED CURETTAGE

≈ LIQUID NITROGEN
- Maximum penetration 14mm
- Fractures
- Nerve injury

≈ PHENOL
- Penetration <1mm

≈ ARGON BEAM
- Penetration 4mm

≈ HYDROGEN PEROXIDE
- Kills tumour cells by direct contact

Sarcoma. 2010;2010. pii: 586090. doi: 10.1155/2010/586090. Epub 2010 Jul 27.

High-Speed Burring with and without the Use of Surgical Adjuvants in the Intralesional Management of Giant Cell Tumor of Bone: A Systematic Review and Meta-Analysis.

Algawahmed H[1], Turcotte R, Farrokhyar F, Ghert M.

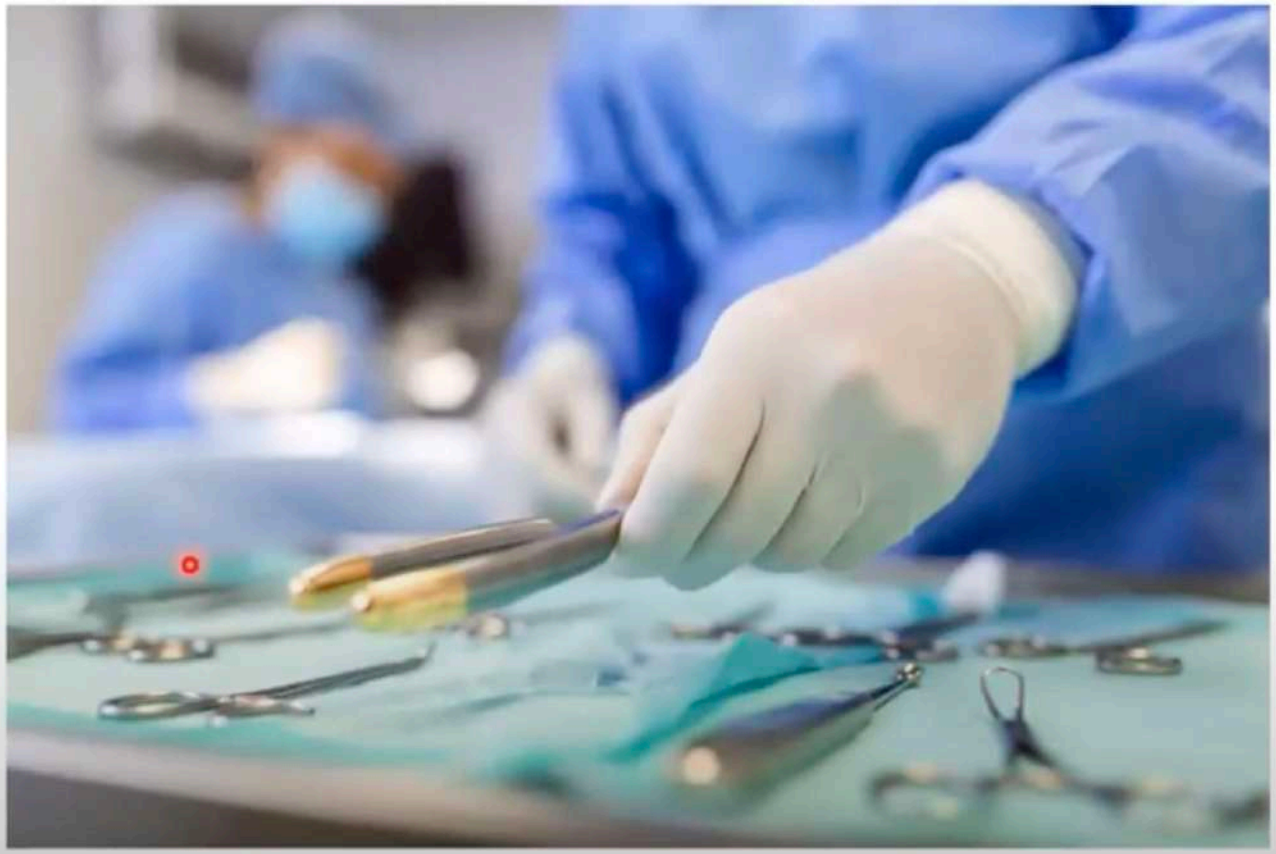
Author information

Abstract

Local control rates for Giant Cell Tumor of Bone (GCT) have been reported in a large number of retrospective series. However, there remains a lack of consensus with respect to the need for a surgical adjuvant when intralesional curettage is performed. We have systematically reviewed the literature and identified six studies in which two groups from the same patient cohort were treated with intralesional curettage and high-speed burring with or without a chemical or thermal adjuvant. Studies were evaluated for quality and pooled data was analyzed using the fixed effects model. Data from 387 patients did not indicate improved local control with the use of surgical adjuvants. Given the available data, we conclude that surgical adjuvants are not required when meticulous tumor removal is performed.

EXTENDED CURETTAGE

CHANGE
DRAPES ,
GLOVES
&
INSTRUMENTS



Harvest bone graft
prior to curettage
(if possible)

Eur J Orthop Surg Traumatol (2013) 23:715–718
DOI 10.1007/s00590-012-1055-3

TECHNICAL NOTE

Iatrogenic implantation of giant cell tumor at bone graft donor site and clinical recommendations to prevent "A Rare Avoidable Complication"

Ashish Gulia · Ajay Puri · Abhijeet Salunke · Subhash Desai · N. A. Jambhekar

Iatrogenic giant cell tumor at bone graft harvesting site

CLINICAL ORTHOPAEDICS AND RELATED RESEARCH
Number 465, pp. 260–264

Zile S Kundu, Vinay Gupta, Sukhbir S Sangwan, Shobit Goel, Parveen Rana[1]

ABSTRACT
30 year old female patient with giant cell tumor of the distal tibia initially treate autologous bone grafting from the ipsilateral iliac crest reported to us with lo graft harvesting site which required extensive surgeries at both sites. The risk to inadequate surgical planning or poor surgical techniques, and the steps t

CASE REPORT

Iatrogenic Seeding of a Giant Cell Tumor of the Patella to the Proximal Tibia

Onder Ofluoglu, MD[*]*; and Rakesh Donthineni, MD, MBA*[†]

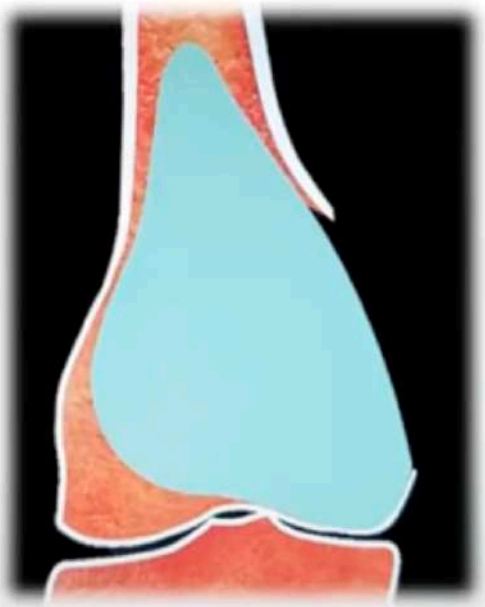
GIANT CELL TUMOUR

BONE GRAFT

- BIOLOGICAL
- AVAILABILITY
- DONOR SITE MORBIDITY
- NON WEIGHT BEARING
- DIFFICULT TO PICK RECURRENCE

CEMENT

- NON BIOLOGICAL
- EARLY JOINT ARTHRITIS
- ? LESSER RATE OF LOCAL RECURRENCE



Mid-Term Outcome After Curettage with Polymethylmethacrylate for Giant Cell Tumor Around the Knee: Higher Risk of Radiographic Osteoarthritis?

The Journal of Bone & Joint Surgery · jbjs.org
Volume 95-A · Number 21 · November 6, 2013

Lizz van der Heijden, MSc, Michiel A.J. van de Sande, MD, PhD, Adriaan C. Heineken, Marta Fiocco, PhD, Rob G.H.H. Nelissen, MD, PhD, and P.D. Sander Dijkstra, MD, PhD

Background: It has been suggested that, when a patient has a giant cell tumor, subchondral bone involvement close to articular cartilage and a hyperthermic reaction from polymethylmethacrylate (PMMA) are risk factors for the development of osteoarthritis. We determined the prevalence, risk factors, and clinical relevance of osteoarthritis on radiographs after curettage and application of PMMA for the treatment of giant cell tumors around the knee.

Methods: This retrospective single-center study included fifty-three patients with giant cell tumor around the knee treated with curettage and PMMA between 1987 and 2007. The median age at the time of follow-up was forty-two years (range, twenty-three to seventy years). There were twenty-nine women. Radiographic evidence of osteoarthritis was defined, preoperatively and postoperatively, as Kellgren and Lawrence grade 3 or 4 (KL3-4). We studied the influence of age, sex, tumor-cartilage distance, subchondral bone involvement (≤3 mm of residual subchondral bone), subchondral bone-grafting, intra-articular fracture, multiple curettage procedures, and complications on progression to KL3-4. Functional outcomes and quality of life were assessed with the Short Form-36 (SF-36), Musculoskeletal Tumor Society (MSTS) score, and Knee injury and Osteoarthritis Outcome Score (KOOS).

Results: After a median duration of follow-up of eighty-six months (range, sixty to 285 months), six patients (11%) had progression to KL3, two (4%) had progression to KL4, and one had preexistent KL4. No patient underwent total knee replacement. The hazard ratio for KL3-4 was 9.0 (95% confidence interval [CI] = 2.0 to 41; p = 0.004) when >70% of the subchondral bone was affected and 4.2 (95% CI = 0.84 to 21; p = 0.081) when the tumor-cartilage distance was ≤3 mm. Age, sex, subchondral bone-grafting, intra-articular fracture, multiple curettage procedures, and complications did not affect progression to KL3-4. Patients with KL3-4 reported lower scores on the KOOS symptom subscale (58 versus 82; p = 0.01), but their scores on the other KOOS subscales, the MSTS score (21 versus 24), and the SF-36 (76 versus 81) were similar to those for the patients with K
2 (KL0-2).

Conclusions: Seventeen percent of patients with giant cell tumor around the knee had radiographic finding
arthritis after treatment with curettage and PMMA. A large amount of subchondral bone involvement close t
cartilage increased the risk for osteoarthritis. The function and quality of life of the patients with KL3-4 were c
with those for the patients with KL0-2, suggesting that radiographic findings of osteoarthritis at the time of in
follow-up had a modest clinical impact. Treatment with curettage and PMMA is safe for primary and recurren
tumors, even large tumors close to the joint.

Mid-Term Outcome After Curettage with Polymethylmethacrylate for Giant Cell Tumor Around the Knee: Higher Risk of Radiographic Osteoarthritis?

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Lizz van der Heijden, MSc, Michiel A.J. van de Sande, MD, PhD, Adriaan C. Heineken, Marta Fiocco, PhD, Rob G.H.H. Nelissen, MD, PhD, and P.D. Sander Dijkstra, MD, PhD

Background: It has been suggested that, when a patient has a giant cell tumor, subchondral bone involvement close to articular cartilage and a hyperthermic reaction from polymethylmethacrylate (PMMA) are risk factors for the development of osteoarthritis. We determined the prevalence, risk factors, and clinical relevance of osteoarthritis on radiographs after curettage and application of PMMA for the treatment of giant cell tumors around the knee.

Methods: This retrospective single-center study included fifty-three patients with giant cell tumor around the knee treated with curettage and PMMA between 1987 and 2007. The median age at the time of follow-up was forty-two years (range, twenty-three to seventy years). There were twenty-nine women. Radiographic evidence of osteoarthritis was defined, preoperatively and postoperatively, as Kellgren and Lawrence grade 3 or 4 (KL3-4). We studied the influence of age, sex, tumor-cartilage distance, subchondral bone involvement (≤3 mm of residual subchondral bone), subchondral bone-grafting, intra-articular fracture, multiple curettage procedures, and complications on progression to KL3-4. Functional outcomes and quality of life were assessed with the Short Form-36 (SF-36), Musculoskeletal Tumor Society (MSTS) score, and Knee injury and Osteoarthritis Outcome Score (KOOS).

Results: After a median duration of follow-up of eighty-six months (range, sixty to 285 months), six patients (11%) had progression to KL3, two (4%) had progression to KL4, and one had preexistent KL4. No patient underwent total knee replacement. The hazard ratio for KL3-4 was 9.0 (95% confidence interval [CI] = 2.0 to 41; p = 0.004) when >70% of the subchondral bone was affected and 4.2 (95% CI = 0.84 to 21; p = 0.081) when the tumor-cartilage distance was ≤3 mm. Age, sex, subchondral bone-grafting, intra-articular fracture, multiple curettage procedures, and complications did not affect progression to KL3-4. Patients with KL3-4 reported lower scores on the KOOS symptom subscale (58 versus 82; p = 0.01), but their scores on the other KOOS subscales, the MSTS score (21 versus 24), and the SF-36 (76 versus 81) were similar to those for the patients with KL0, 1, or 2 (KL0-2).

Conclusions: Seventeen percent of patients with giant cell tumor around the knee had radiographic findings of osteoarthritis after treatment with curettage and PMMA. A large amount of subchondral bone involvement close to articular cartilage increased the risk for osteoarthritis. The function and quality of life of the patients with KL3-4 were comparable with those for the patients with KL0-2, suggesting that radiographic findings of osteoarthritis at the time of intermediate follow-up had a modest clinical impact. Treatment with curettage and PMMA is safe for primary and recurrent giant cell tumors, even large tumors close to the joint.

Orthop Traumatol Surg Res. 2017 Nov;103(7):1075-1079. doi: 10.1016/j.otsr.2017.06.013. Epub 2017 Aug 3.

Does curettage-cement packing for treating giant cell tumors at the knee lead to osteoarthritis?

Caubère A[1], Harrosch S[2], Fioravanti M[2], Curvale G[2], Rochwerger A[2], Mattei JC[2].

⊕ Author information

Abstract

INTRODUCTION: Giant cell tumors (GCTs) make up 15 to 20% of bone-related tumors in adults. They are often found around the knee in the metaphysis and epiphysis area, contacting the joint cartilage. The aims of our study were to evaluate the presence of early knee osteoarthritis (OA) in patients with GCTs in the knee area treated by curettage-cement packing, and to evaluate whether replacing subchondral bone with acrylic cement has an effect on the functional outcomes and quality of life.

MATERIAL AND METHODS: This was a retrospective study of all patients operated between 2000 and 2010 by the same specialized surgical team. Functional outcomes and quality of life were evaluated in each patient using the Knee Injury and Osteoarthritis Outcome (KOOS), the Musculoskeletal Tumor Society Score (MSTS) and the Short Form-36 (SF-36). The presence of OA was evaluated in a full radiological work-up comparing the operated knee with the healthy contralateral knee. Knee OA was defined as grade 3 or grade 4 radiographic findings based on the Kellgren and Lawrence classification, and a significant difference between the operated and contralateral knee.

RESULTS: Nineteen patients were included in this study. The average follow-up was 120 months (range 60-180). Four patients (21%) had radiographic KL-3 and one patient (5%) had KL-4. Eight patients (42%) had recurrence of the GCT. The distance between the tumor and cartilage, and the area of the subchondral bone invaded by the tumor appeared to contribute to OA progression.

DISCUSSION: Resection of GCTs around the knee by curettage-cement packing did not have an effect on development of OA. In the four patients who developed knee OA, the tumor was located less than 3mm from the joint cartilage and took up more than 90% of the epiphysis. Based on these observations, there seems to be a strong correlation between the development of knee OA and the small quantity of subchondral bone left after curettage. The functional outcomes and quality of life were similar no matter the knee OA grade in patients. Replacing subchondral bone by cement had no effect on quality of life in this study.

LEVEL OF EVIDENCE: IV (retrospective study).

Clin Orthop Relat Res. 2002 Apr;(397):248-58.

Giant cell tumor of long bone: a Canadian Sarcoma Group study.

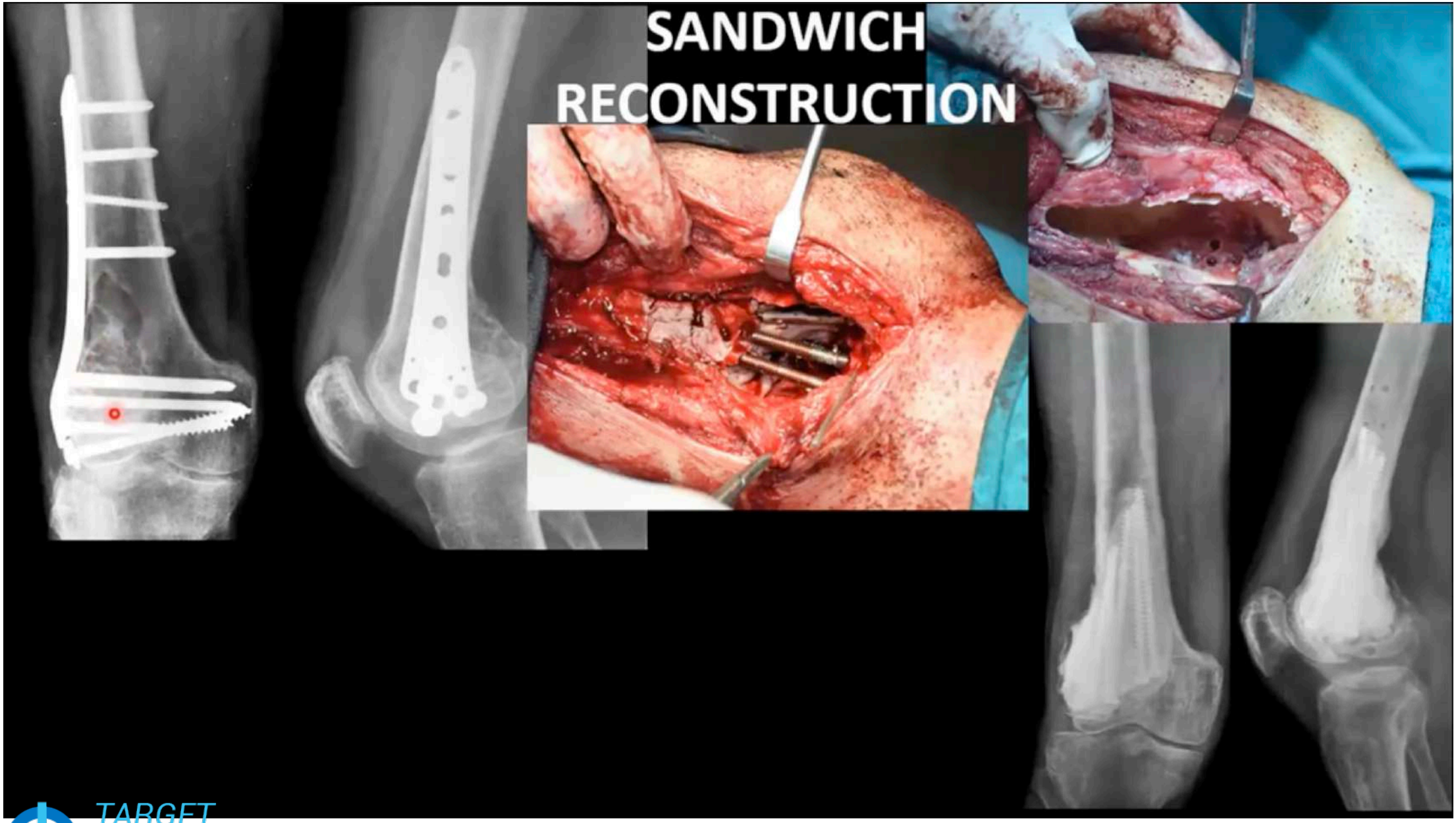
Turcotte RE[1], Wunder JS, Isler MH, Bell RS, Schachar N, Masri BA, Moreau G, Davis AM; Canadian Sarcoma Group.

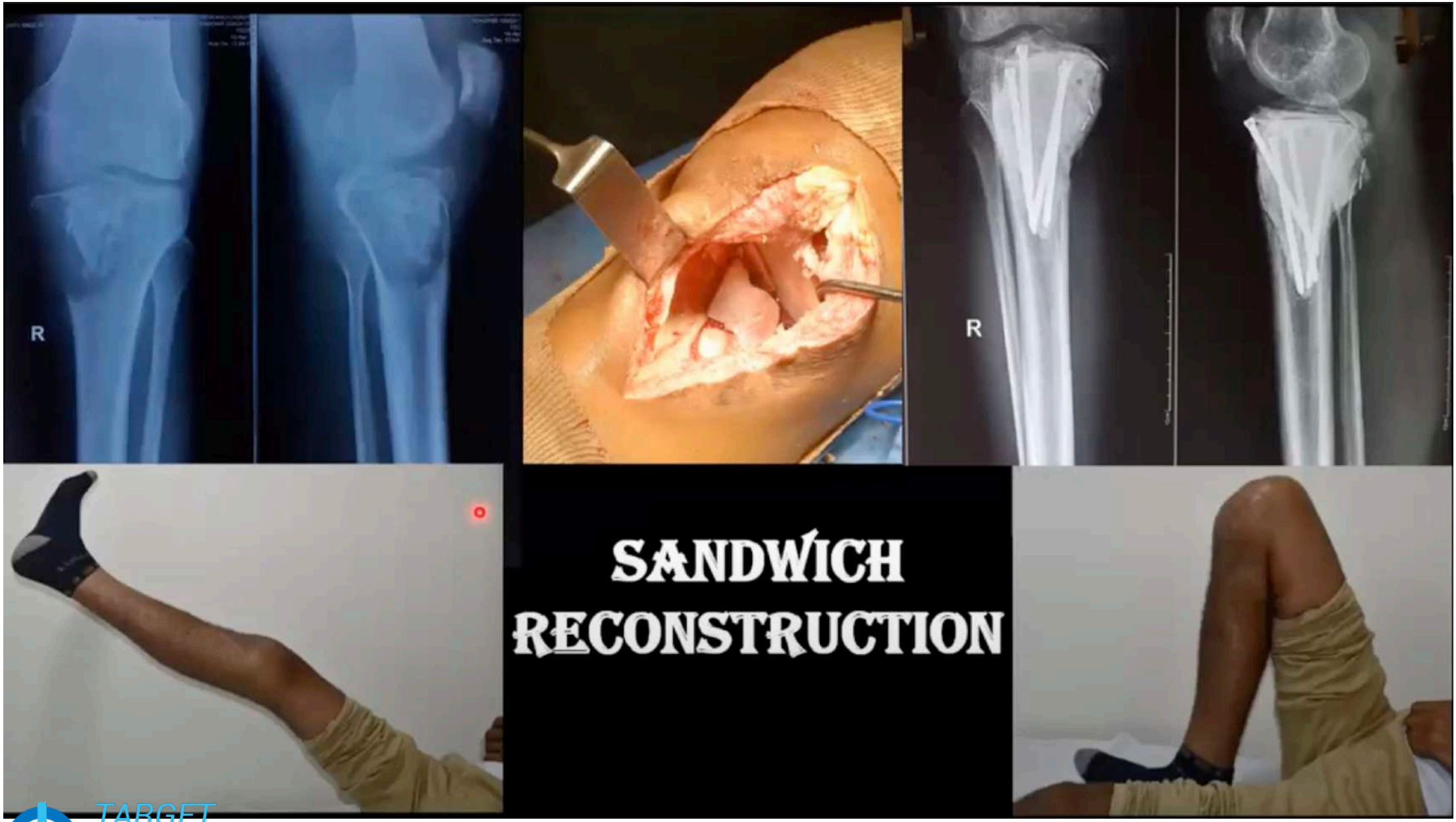
Author information

Abstract

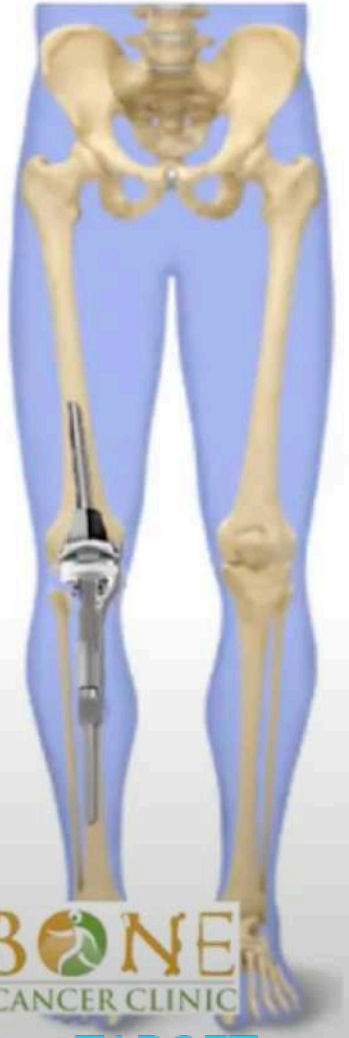
A multicentric retrospective study of giant cell tumor of bone was conducted among Canadian surgeons. The hypothesis was that no differences would be found in health status, function, or recurrence rate irrespective to the nature of filling material or adjuvant used in patients treated with curettage. One hundred eighty-six cases were collected. There were 96 females and 90 males. The mean age of the patients was 36 years (range, 14-72 years), the minimum followup was 24 months, and the median followup was 60 months. Sixty-two percent of the tumors involved the knee region. One hundred fifty-eight were primary tumors and 28 were recurrences. Campanacci grading was as follows: Grade 1, seven patients; Grade 2, 100 patients; Grade 3, 76 patients; and unknown in three patients. Fifty-six patients had a pathologic fracture. Resection was done in 38 patients and 148 patients had curettage. The latter was supplemented with high speed burring in 135 patients, cement in 64 patients, various combinations of autograft or allograft bone in 61 patients, phenol in 37 patients, and liquid nitrogen in 10 patients. Structural allografts were used in 25 patients. The overall recurrence rate was 17%, 18% after curettage, and 16% after resection. Patients with primary tumors treated with curettage had a 10% recurrence rate. For recurrent lesions treated by curettage, the recurrence rate was 35%. The nature of the filling material used or the type of adjuvant method used or any combination of both failed to show any statistical impact on the recurrence risk. The results from the Musculoskeletal Tumor Society rating from 1987 were significantly lower in patients who sustained a displaced fracture. Results from the bodily pain section of the Short Form-36 also were found to be lower when a pathologic fracture was present. Results from the Musculoskeletal Tumor Society Rating 1987, the Short Form-36, and the Toronto Extremity Salvage Score did not show differences when either cement or bone graft were used after curettage.

SANDWICH RECONSTRUCTION



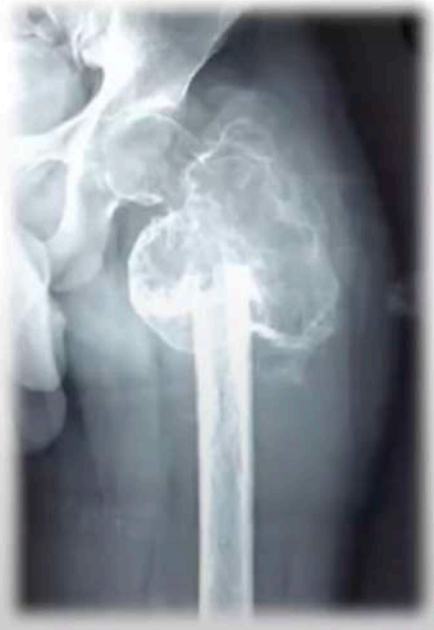


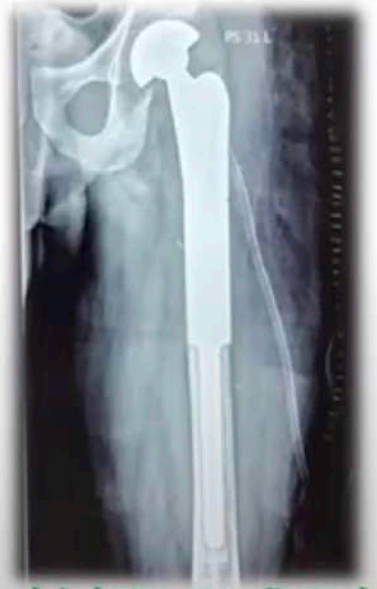
GIANT CELL TUMOUR



RESECTION

- PATHOLOGICAL FRACTURE WITH BONE DEFORMITY





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THE BONE & JOINT JOURNAL

■ ONCOLOGY

Does pathological fracture affect the rate of local recurrence in patients with a giant cell tumour of bone?

A META-ANALYSIS

A. A. Salunke,
Y. Chen,
X. Chen,
J. H. Tan,
G. Singh,
B. C. Tai,
L. W. Khin,
M. E. Puhaindran

From Department of Orthopaedic Surgery, National University Health System, Singapore

■ A. A. Salunke, MBBS, DNB(Orth), Clinical Fellow, Division of Musculoskeletal Oncology
■ Y. Chen, MBBS, MRCS (Ireland), Senior Resident, Division of Musculoskeletal Oncology
X. Chen, MD, Medical Officer,

We investigated whether the presence of a pathological fracture increased the risk of local recurrence in patients with a giant cell tumour (GCT) of bone. We also assessed if curettage is still an appropriate form of treatment in the presence of a pathological fracture. We conducted a comprehensive review and meta-analysis of papers which reported outcomes in patients with a GCT with and without a pathological fracture at presentation. We computed the odds ratio (OR) of local recurrence in those with and without a pathological fracture.

We selected 19 eligible papers for final analysis. This included 3215 patients, of whom 580 (18.0%) had a pathological fracture. The pooled OR for local recurrence between patients with and without a pathological fracture was 1.05 (95% confidence interval (CI) 0.66 to 1.67, p = 0.854). Amongst the subgroup of patients who were treated with curettage, the pooled OR for local recurrence was 1.23 (95% CI 0.75 to 2.01, p = 0.417).

A *post hoc* sample size calculation showed adequate power for both comparisons.

There is no difference in local recurrence rates between patients who have a GCT of bone with and without a pathological fracture at the time of presentation. The presence of a pathological fracture should not preclude the decision to perform curettage as carefully selected patients who undergo curettage can have similar outcomes in terms of local recurrence to those without such a fracture.

Cite this article: *Bone Joint J* 2015;97-B:1566–71.

Clin Orthop Relat Res (2013) 471:820–829
DOI 10.1007/s11999-012-2546-6

Clinical Orthopaedics and Related Research®
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Giant Cell Tumor With Pathologic Fracture: Should We Curette or Resect?

Lizz van der Heijden MSc, P. D. Sander Dijkstra MD, PhD,
Domenico A. Campanacci MD, PhD,
C. L. Max H. Gibbons MD, PhD, Michiel A. J. van de Sande MD, PhD

Abstract

Background Approximately one in five patients with giant cell tumor of bone presents with a pathologic fracture. However, recurrence rates after resection or curettage differ substantially in the literature and it is unclear when curettage is reasonable after fracture.

Questions/Purposes We therefore determined: (1) local recurrence rates after curettage with adjuvants or en bloc resection; (2) complication rates after both surgical techniques and whether fracture healing occurred after curettage with adjuvants; and (3) function after both treatment modalities for giant cell tumor of bone with a pathologic fracture.

Methods We retrospectively reviewed 48 patients with fracture from among 422 patients treated between 1981 and 2009. The primary treatment was resection in 25 and curettage with adjuvants in 23 patients. Minimum followup was 27 months (mean, 101 months; range, 27–293 months).

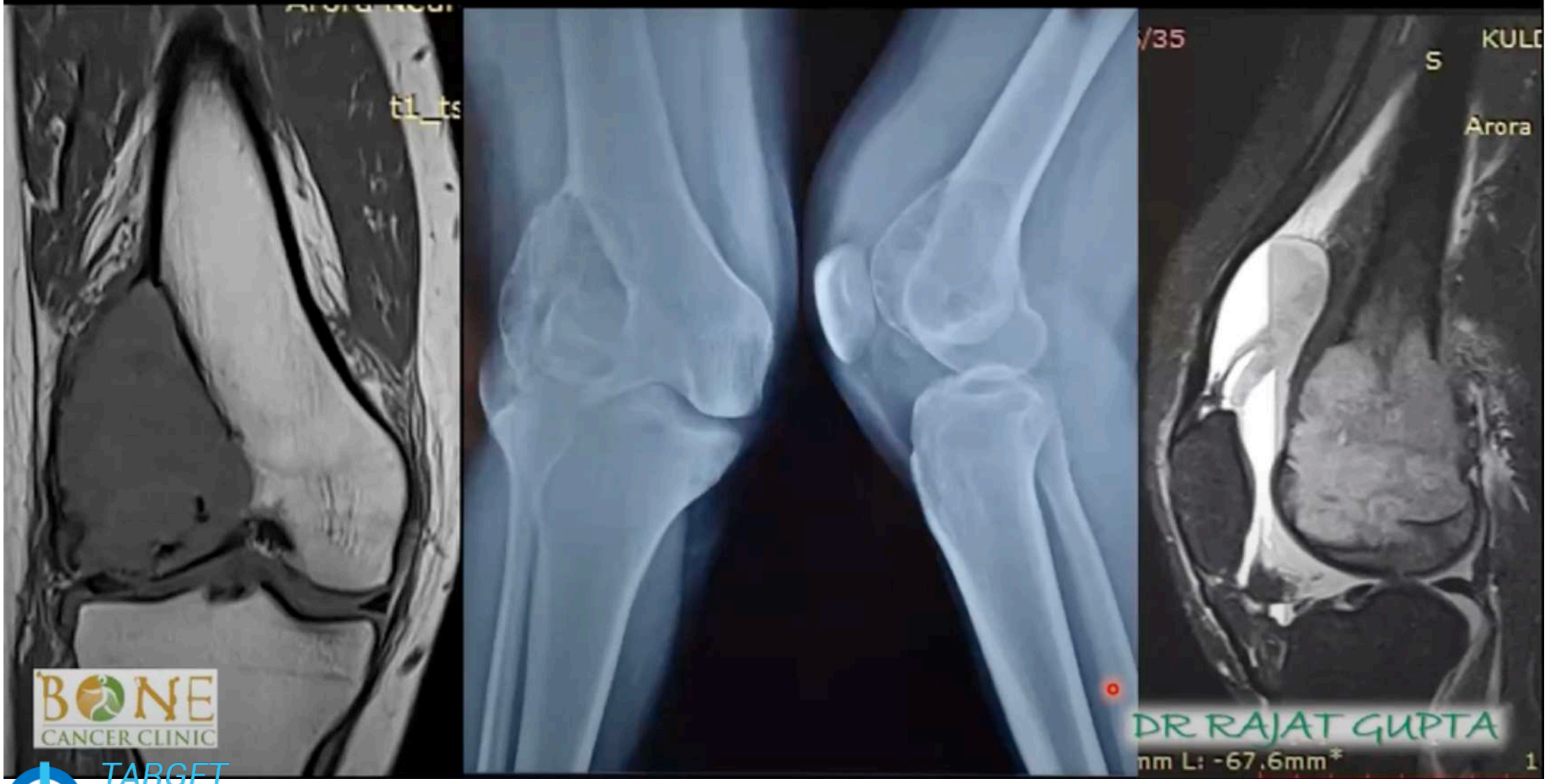
Results Recurrence rate was higher after curettage with adjuvants when compared with resection (30% versus 0%). Recurrence risk appears higher with soft tissue extension. The complication rate was lower after curettage with adjuvants when compared with resection (4% versus 16%) and included aseptic loosening of prosthesis, allograft failure, and pseudoarthrosis. Tumor and fracture characteristics did not increase complication risk. Fracture healing occurred in 24 of 25 patients. Mean Musculoskeletal Tumor Society score was higher after curettage with adjuvants (mean, 28; range, 23–30; n = 18) when compared with resection (mean, 25; range, 13–30; n = 25).

Conclusions Our observations suggest curettage with adjuvants is a reasonable option for giant cell tumor of bone with pathologic fractures. Resection should be considered with soft tissue extension, fracture through a local recurrence, or when structural integrity cannot be regained after reconstruction.

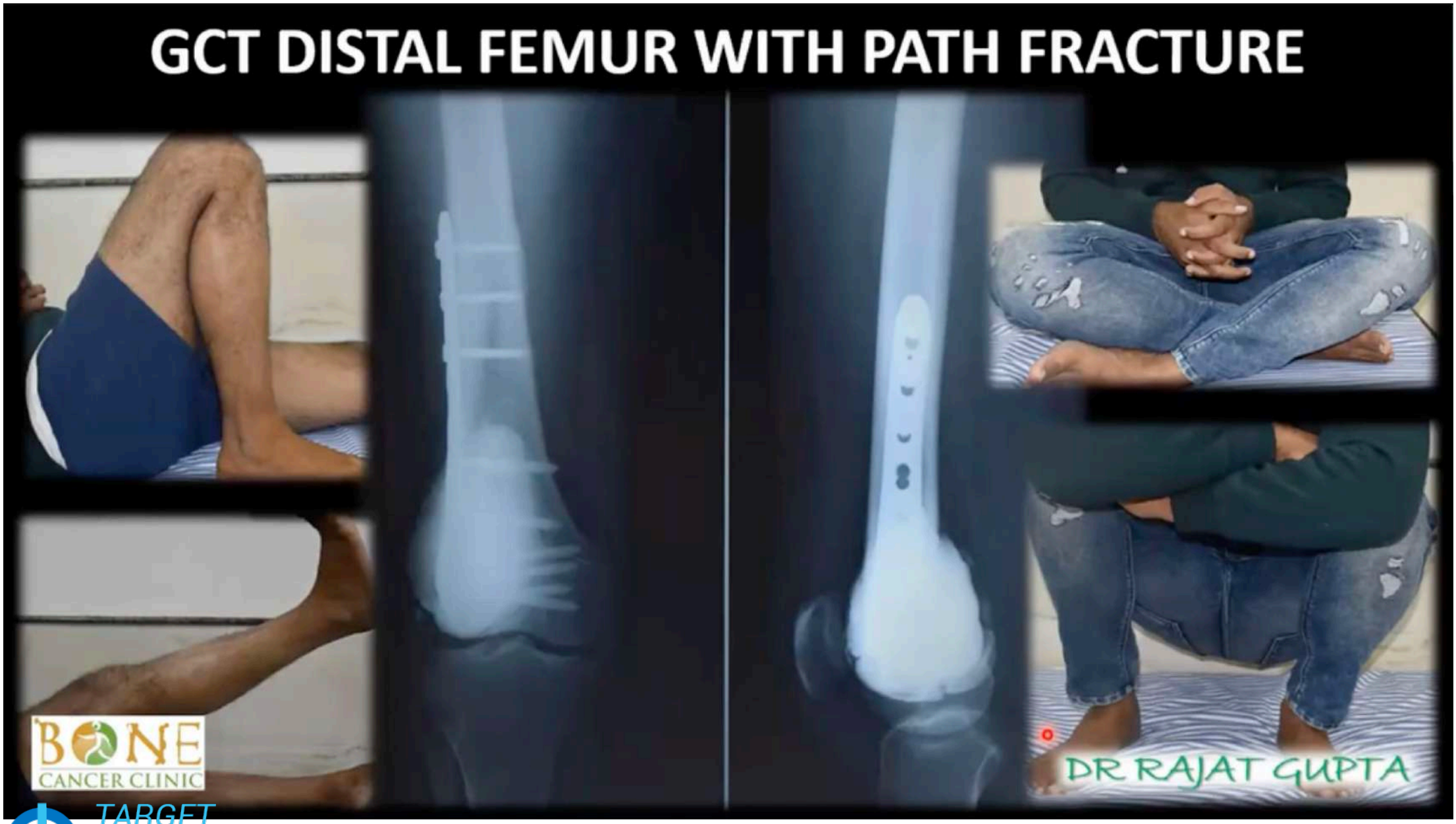
Each author certifies that he or she, or a member of his or her immediate family, has no funding or commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article.
All ICMJE Conflict of Interest Forms for authors and *Clinical Orthopaedics and Related Research* editors and board members are on file with the publication and can be viewed on request.
Each author certifies that his or her institution approved or waived approval for the human protocol for this investigation and that all investigations were conducted in conformity with ethical principles of research.
This work was performed at the Leiden University Medical Center, Leiden, The Netherlands.

L. van der Heijden (✉), P. D. S. Dijkstra, M. A. J. van de Sande
Department of Orthopaedic Surgery, Leiden
University Medical Center, Postzone J11-R70,

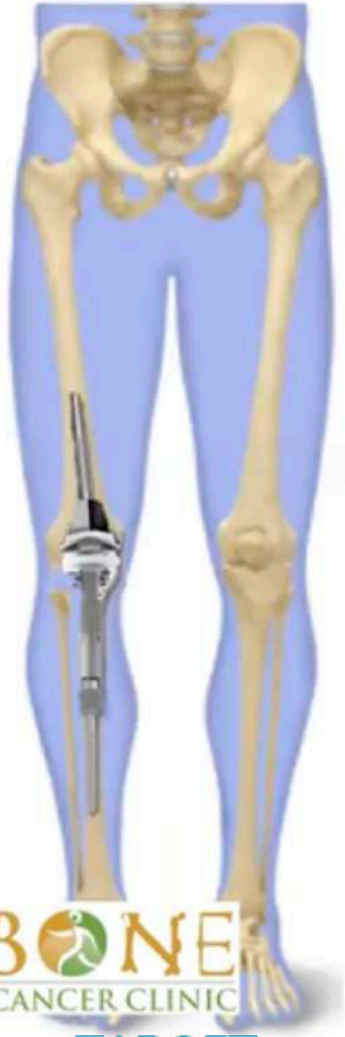
GCT DISTAL FEMUR WITH PATH FRACTURE



GCT DISTAL FEMUR WITH PATH FRACTURE

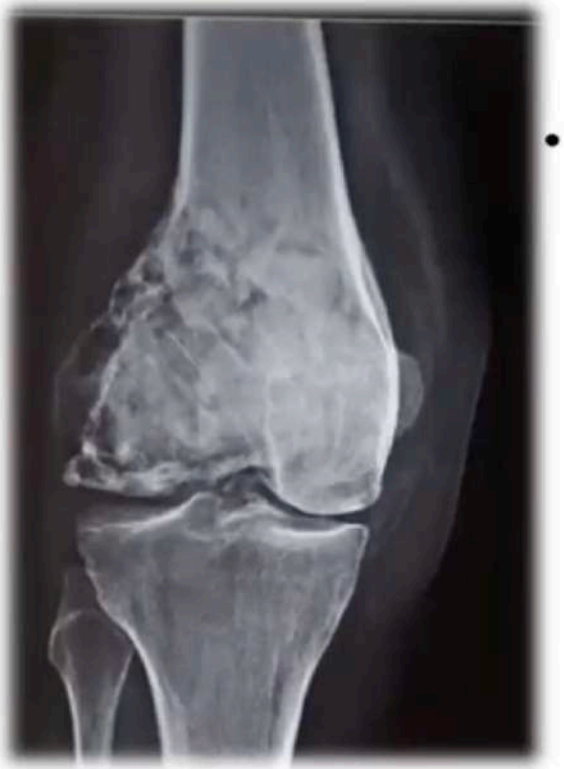


GIANT CELL TUMOUR



RESECTION

- PATHOLOGICAL FRACTURE WITH BONE DEFORMITY



- RECURRENT CASE WITH JOINT DAMAGE OR NO RESIDUAL BONE

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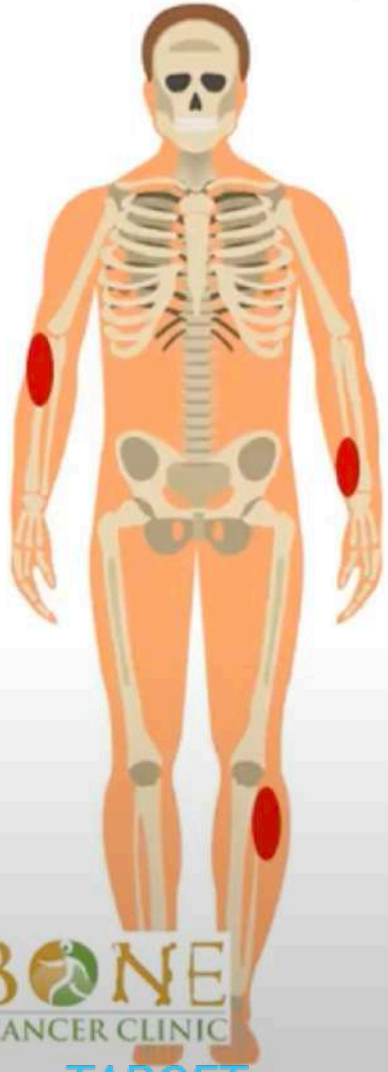
GIANT CELL TUMOUR



RESECTION

- PATHOLOGICAL FRACTURE WITH BONE DEFORMITY
- RECURRENT CASE WITH JOINT DAMAGE OR NO RESIDUAL BONE
- EXPENDABLE BONES

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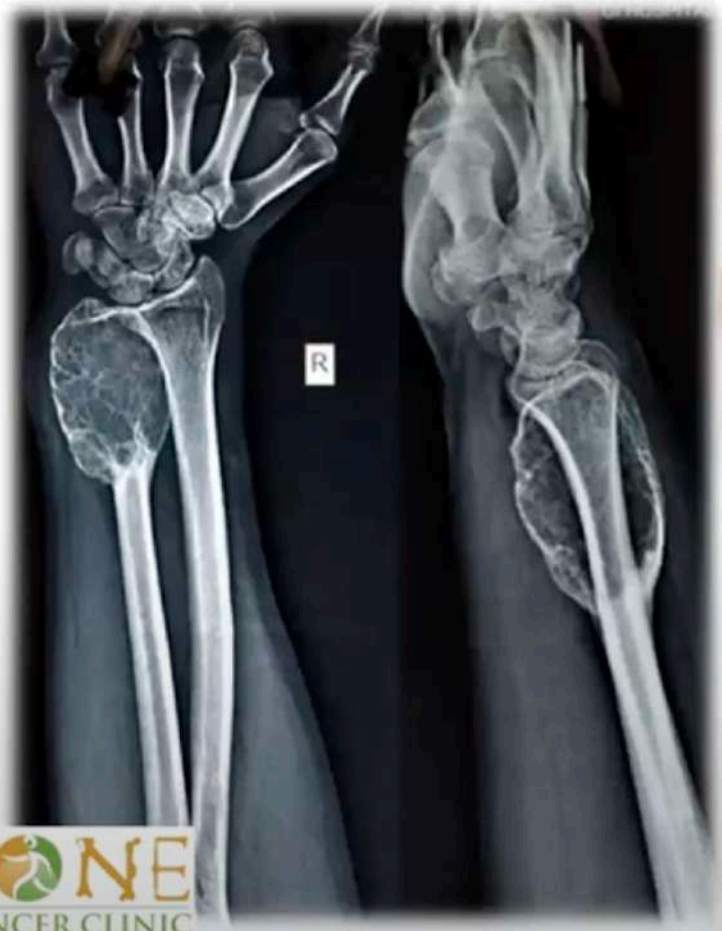
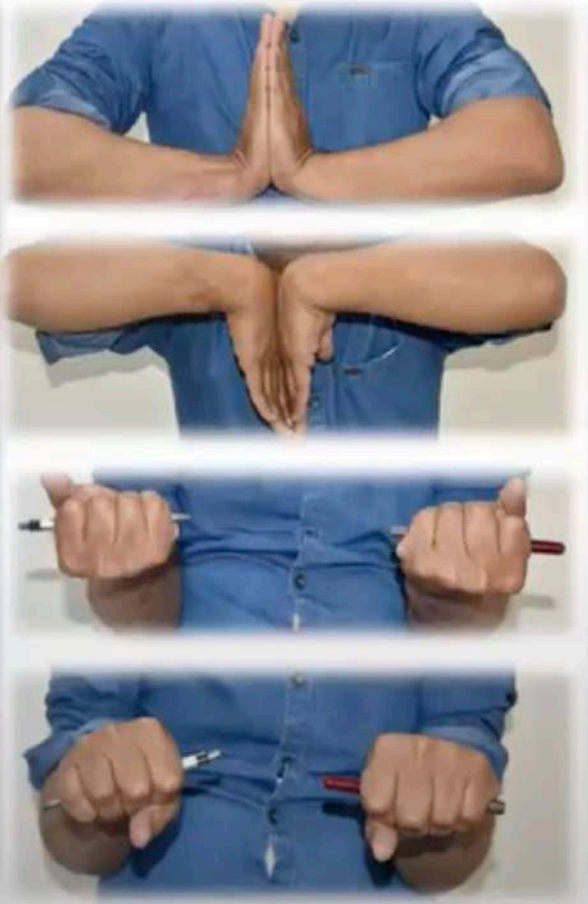
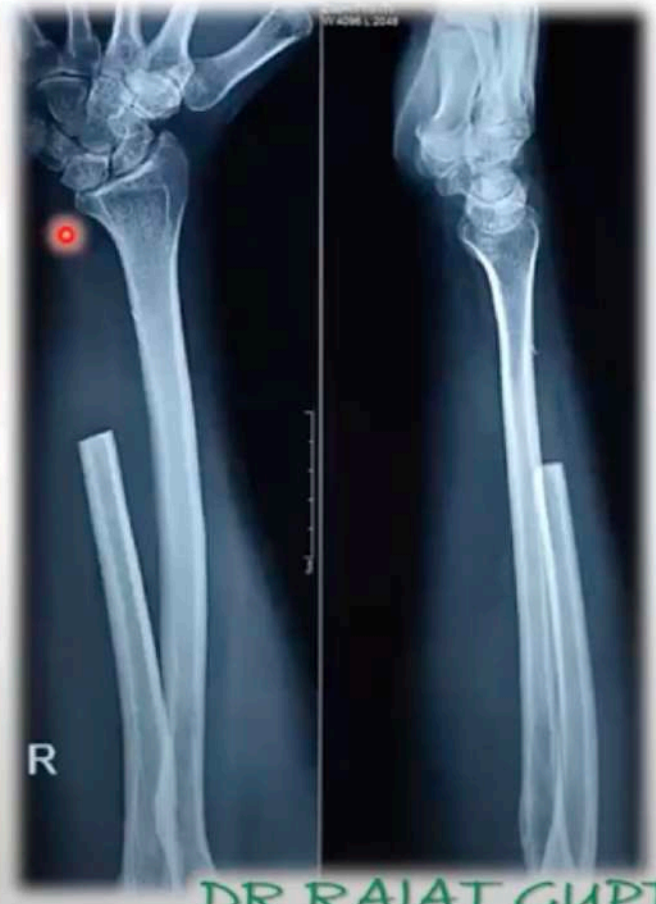
BONE CANCER CLINIC

GIANT CELL TUMOUR







BONE CANCER CLINIC

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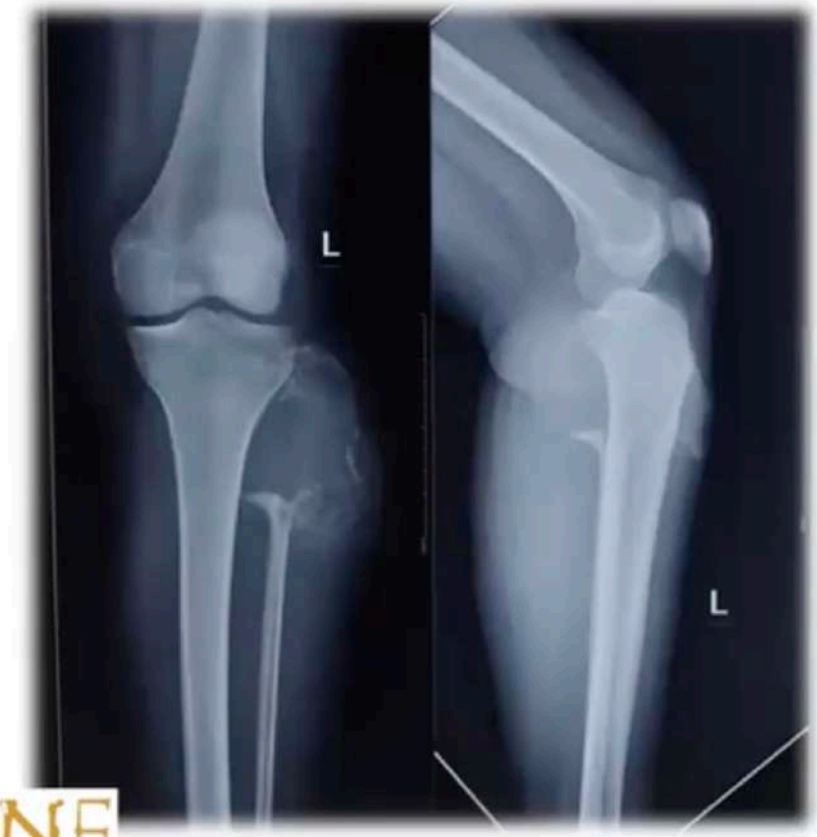
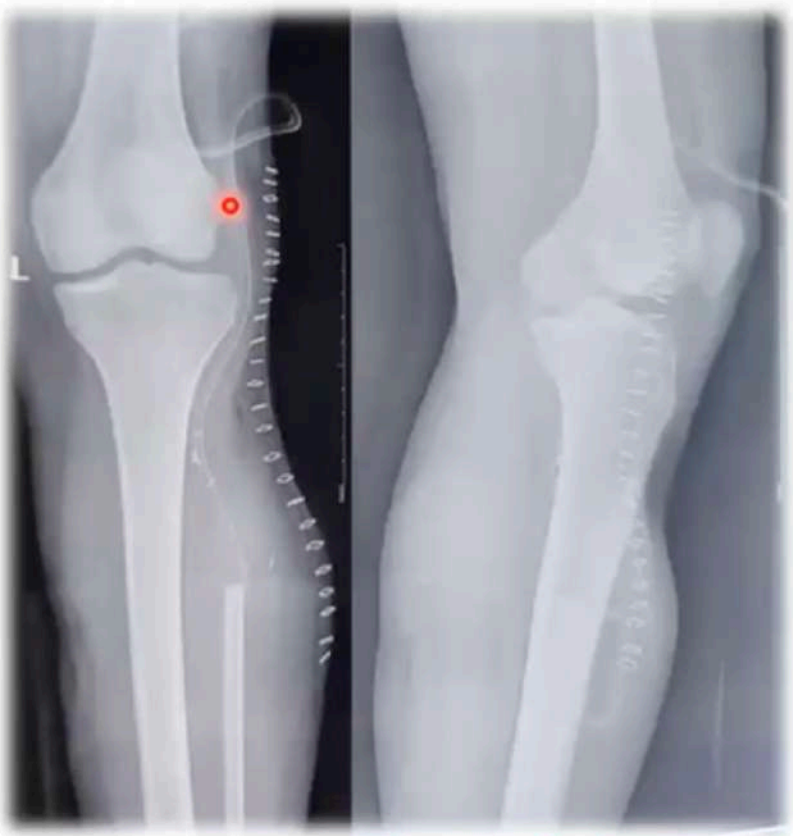
GIANT CELL TUMOUR





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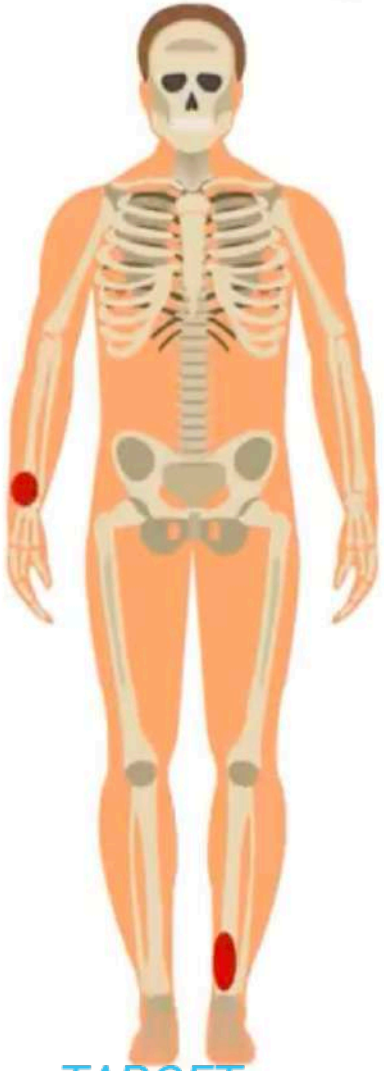
GIANT CELL TUMOUR

RESECTION



RECONSTRUCTION IS PREFERRED WITH BONE

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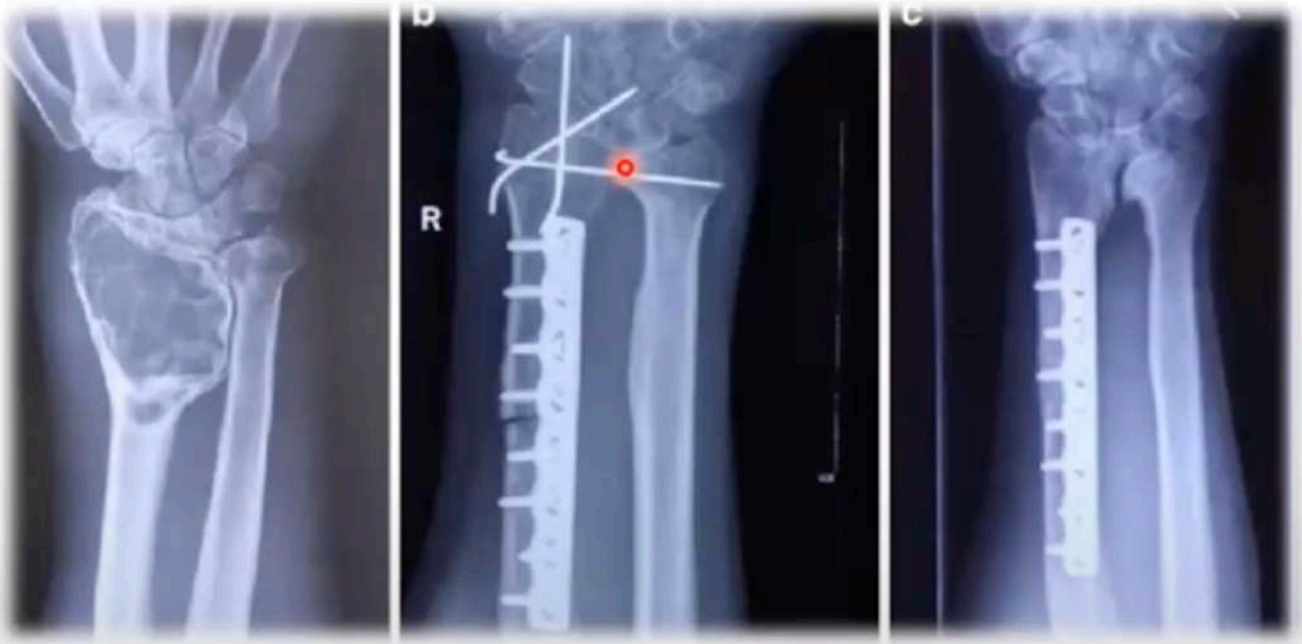
GIANT CELL TUMOUR

DISTAL RADIUS

FIBULA ARTHROPLASTY

- WRIST MOVEMENTS
- BETTER COSMESIS



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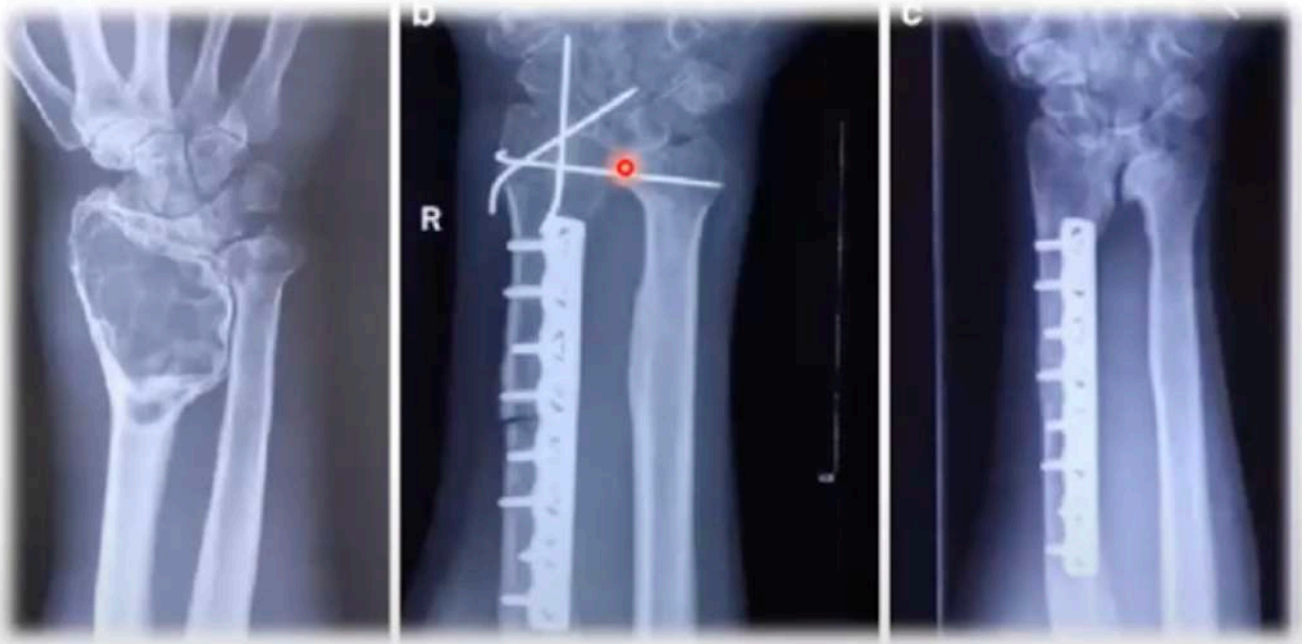
GIANT CELL TUMOUR

DISTAL RADIUS

FIBULA ARTHROPLASTY

- WRIST MOVEMENTS
- BETTER COSMESIS



- UNSTABLE JOINT
- DONOR SITE MORBIDITY
- AVASCULAR GRAFT
- JOINT INCONGRUENCY

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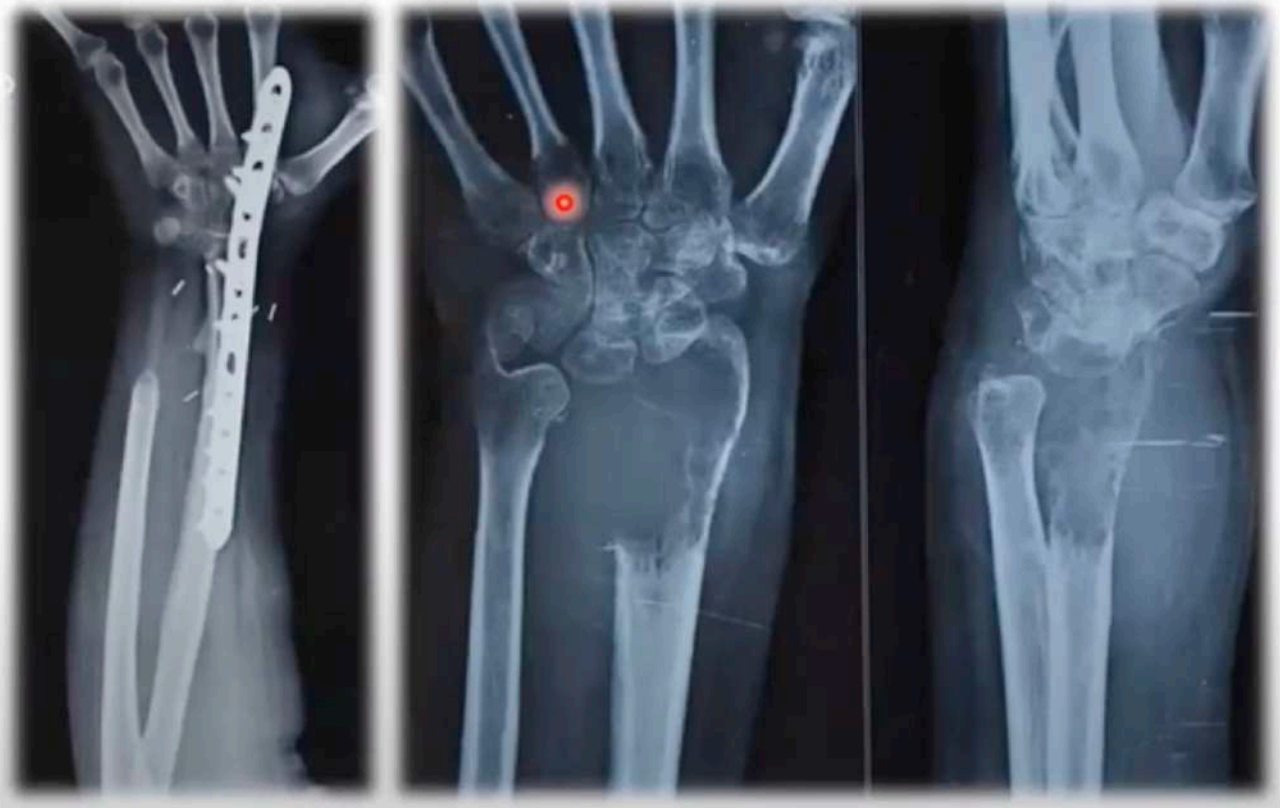
GIANT CELL TUMOUR

DISTAL RADIUS

ULNAR TRANSLOCATION

- STABLE JOINT
- VASCULAR GRAFT
- NO DONOR SITE MORBIDITY
- FULL PRONATION SUPINATION



BONE CANCER CLINIC

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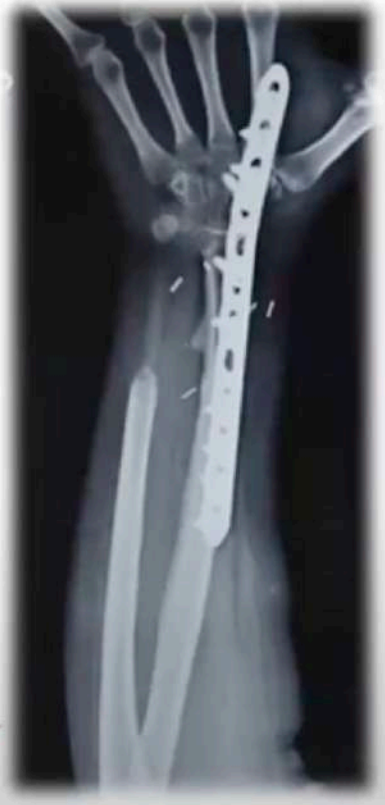
GIANT CELL TUMOUR

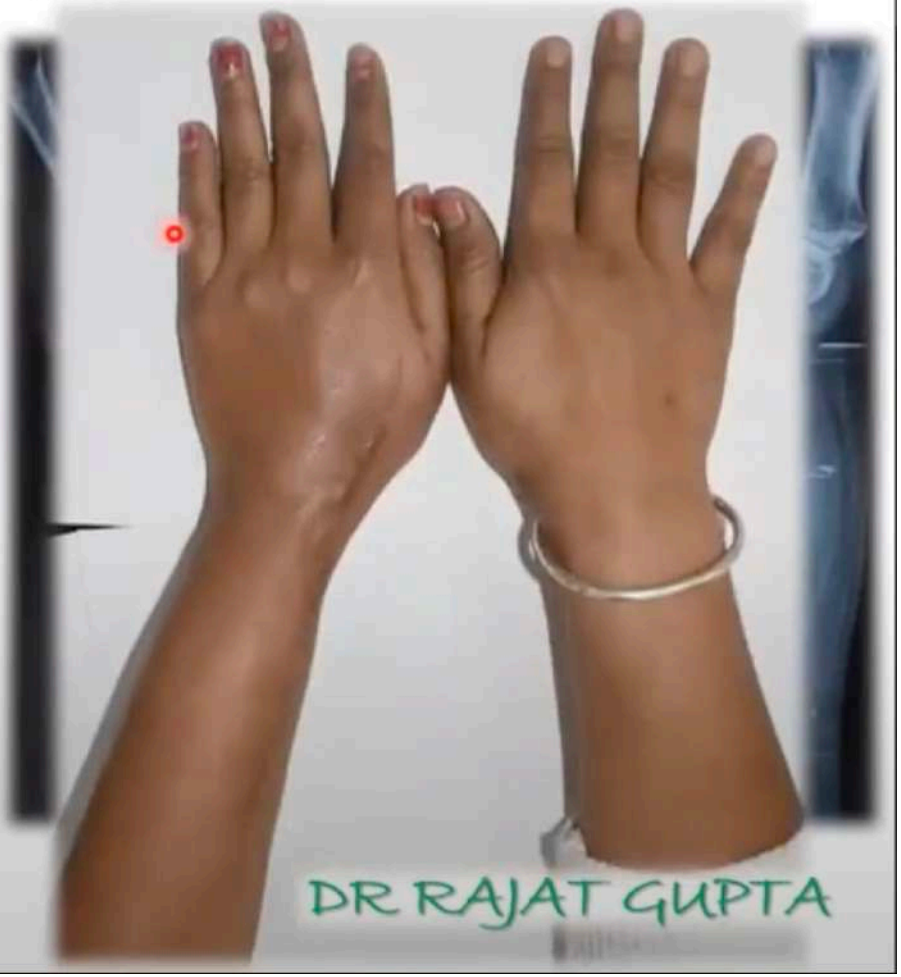
DISTAL RADIUS

ULNAR TRANSLOCATION

- STABLE JOINT
- VASCULAR GRAFT
- NO DONOR SITE MORBIDITY
- FULL PRONATION SUPINATION

- HOUR GLASS WRIST





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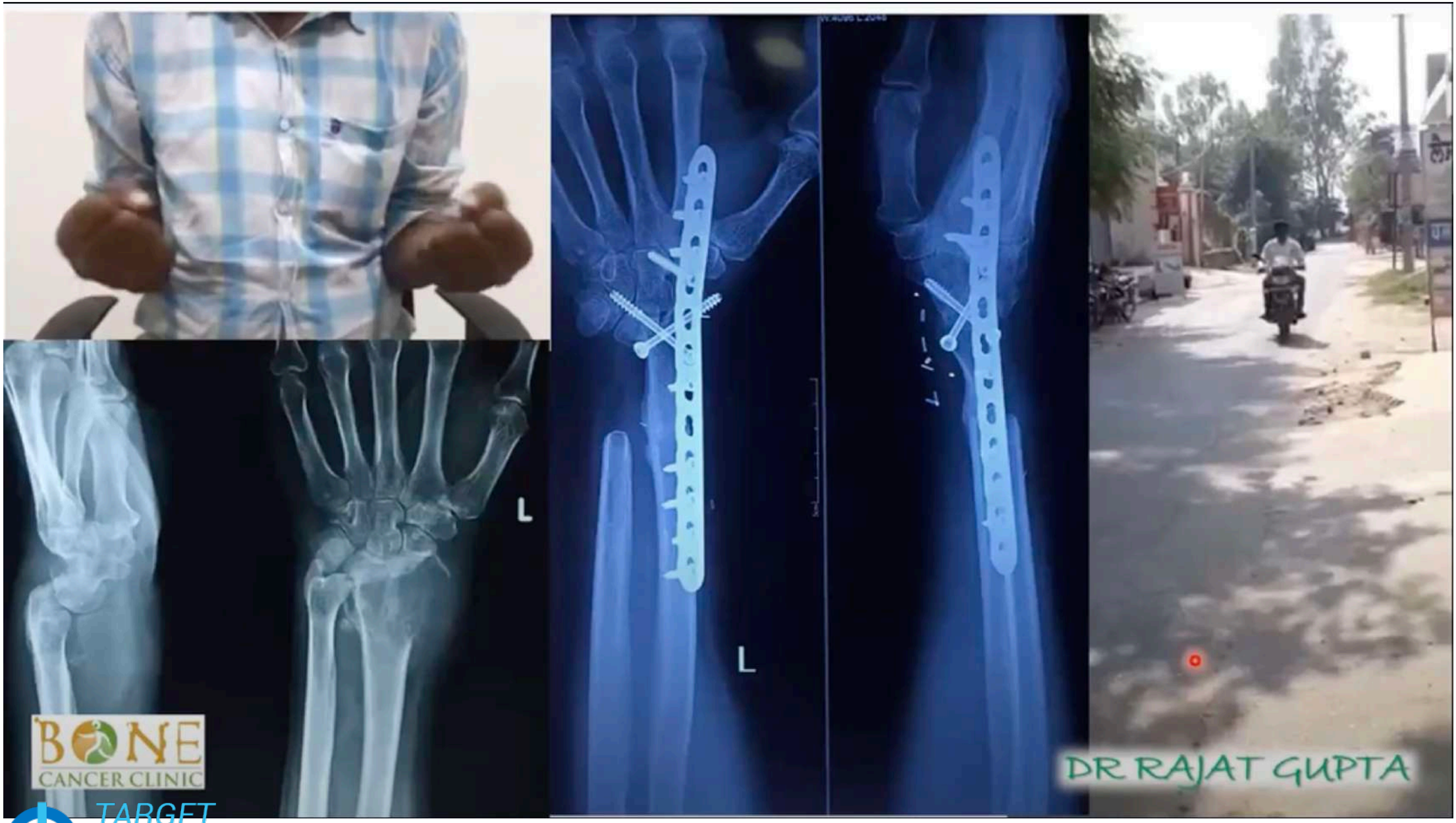
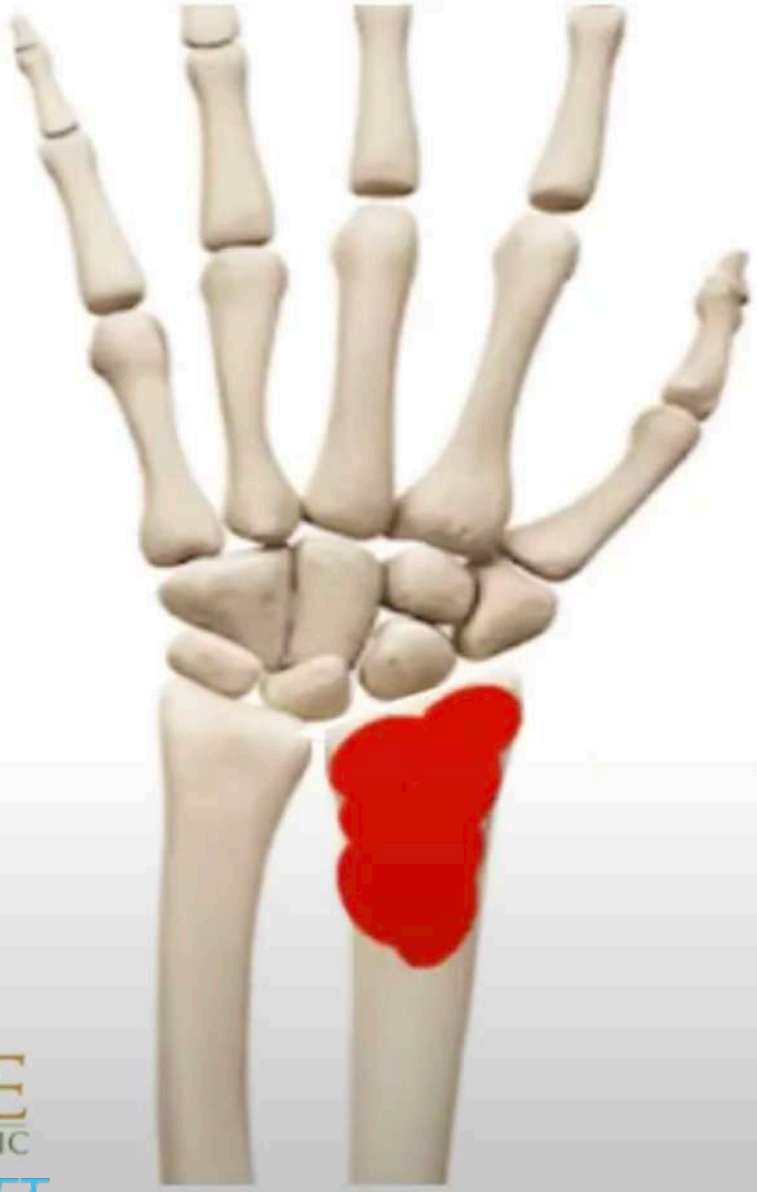
BONE CANCER CLINIC





RESECTION

If diseased bone is removed in multiple pieces, (NOT THE RIGHT WAY)

DR RAJAT GUPTA

BONE CANCER CLINIC

GIANT CELL TUMOUR

TREATMENT

DECREASES BLOOD SUPPLY TO TUMOUR CELLS

NON SURGICAL MODALITIES

- **ANGIOEMBOLISATION**

PRIOR TO CURETTAGE

DEFINITIVE TREATMENT WITH BISPHOSPHONATES IN UNRESECTABLE GCT

BONE CANCER CLINIC

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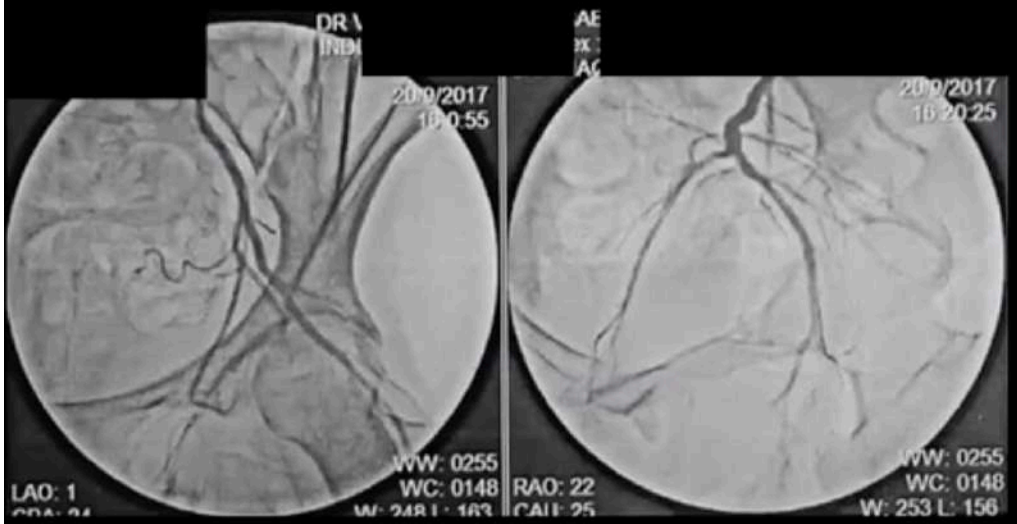
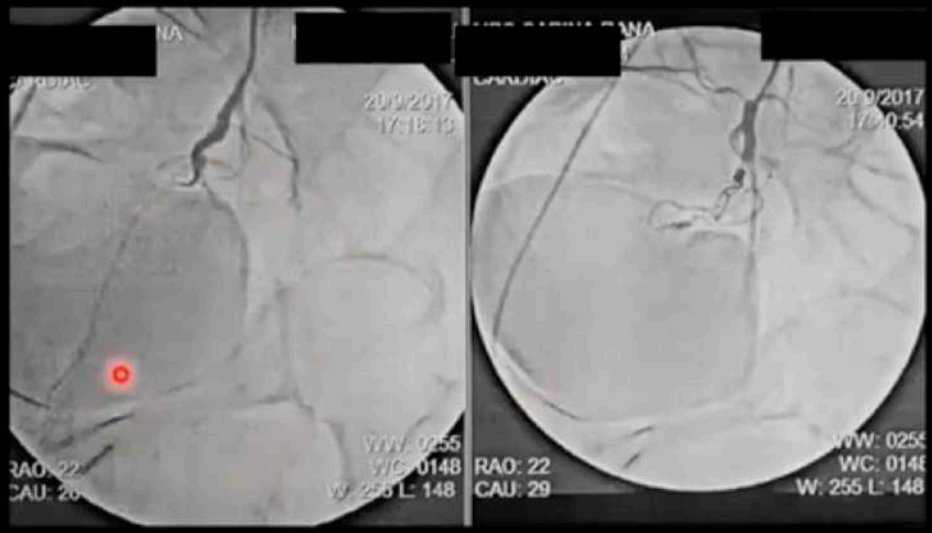


PRE-EMBOLISATION



POST EMBOLISATION

BONE CANCER CLINIC

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GIANT CELL TUMOUR

TREATMENT

CAUSE APOPTOSIS OF OSTEOCLASTS

ADJUVANT TO DECREASE RISK OF LOCAL RECURRENCE

NON SURGICAL MODALITIES

- ANGIOEMBOLISATION
- **ZOLENDRONIC ACID**

DEFINITIVE TREATMENT WITH ANGIOEMBOLISATION IN UNRESECTABLE GCT

BONE CANCER CLINIC

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GIANT CELL TUMOUR

TREATMENT

MONOCLONAL ANTIBODY AGAINST RANKL

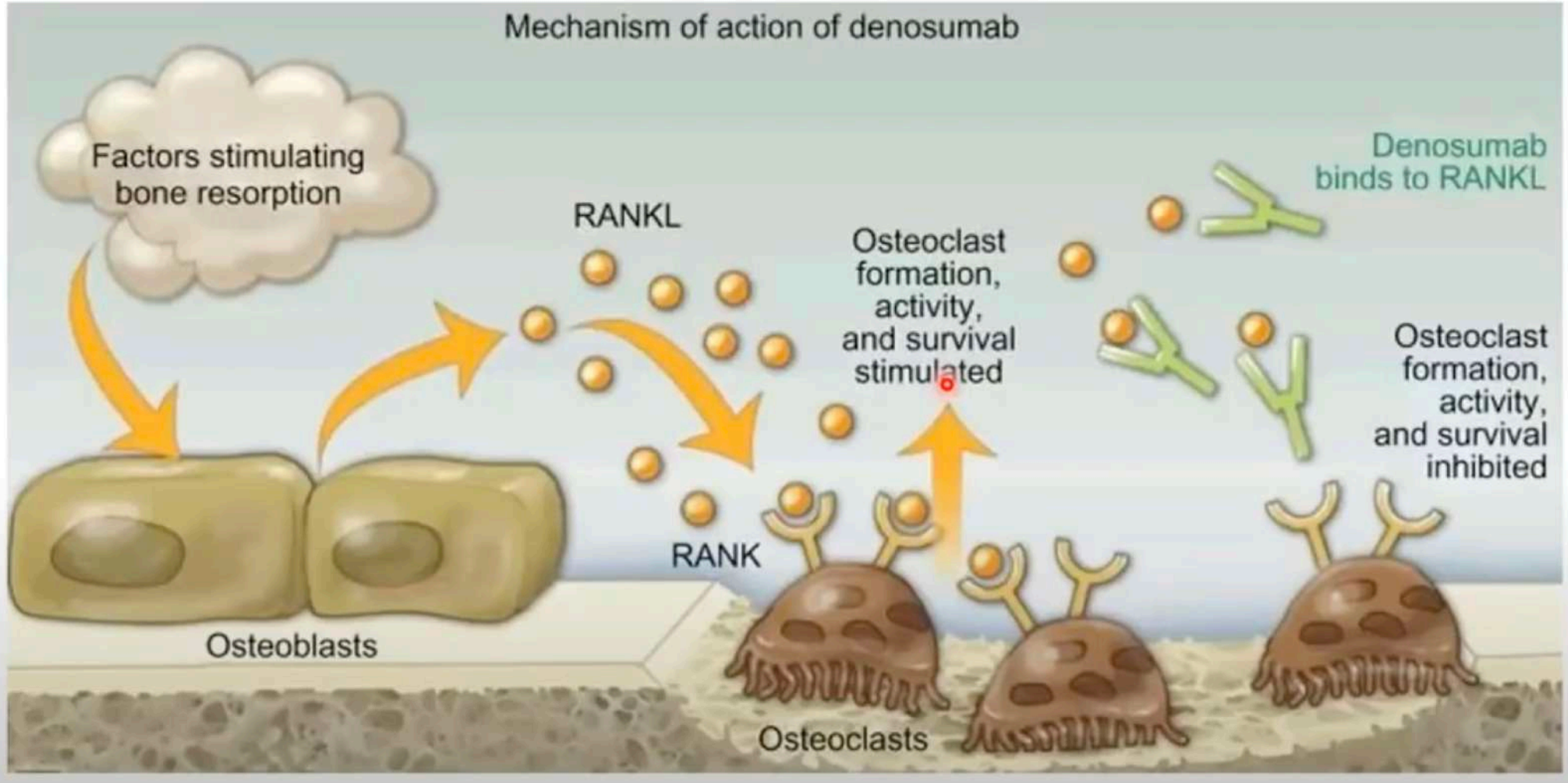
NON SURGICAL MODALITIES

- ANGIOEMBOLISATION
- ZOLENDRONIC ACID
- DENOSUMAB

BONE CANCER CLINIC

DR RAJAT GUPTA

GIANT CELL TUMOUR



Denosumab in patients with giant-cell tumour of bone: an open-label, phase 2 study

David Thomas, Robert Henshaw, Keith Skubitz, Sant Chawla, Arthur Staddon, Jean-Yves Blay, Martine Roudier, Judy Smith, Zhishen Ye, Winnie Sohn, Roger Dansey, Susie Jun

Summary

Background Giant-cell tumour (GCT) of bone is a primary osteolytic bone tumour with low metastatic potential and is associated with substantial skeletal morbidity. GCT is rich in osteoclast-like giant cells and contains mononuclear (stromal) cells that express RANK ligand (RANKL), a key mediator of osteoclast activation. We investigated the potential therapeutic effect of denosumab, a fully human monoclonal antibody against RANKL, on tumour-cell survival and growth in patients with GCT.

Methods In this open-label, single-group study, 37 patients with recurrent or unresectable GCT were enrolled and received subcutaneous denosumab 120 mg monthly (every 28 days), with loading doses on days 8 and 15 of month 1. The primary endpoint was tumour response, defined as elimination of at least 90% of giant cells or no radiological progression of the target lesion up to week 25. Study recruitment is closed; patient treatment and follow-up are ongoing. The study is registered with Clinical Trials.gov, NCT00396279.

Findings Two patients had insufficient histology or radiology data for efficacy assessment. 30 of 35 (86%; 95% CI 70–95) of evaluable patients had a tumour response: 20 of 20 assessed by histology and 10 of 15 assessed by radiology. Adverse events were reported in 33 of 37 patients; the most common being pain in an extremity (n=7), back pain (n=4), and headache (n=4). Five patients had grade 3–5 adverse events, only one of which (grade 3 increase in human chorionic gonadotropin concentration not related to pregnancy) was deemed to be possibly treatment related. Five serious adverse events were reported although none were deemed treatment related.

Interpretation Further investigation of denosumab as a therapy for GCT is warranted.

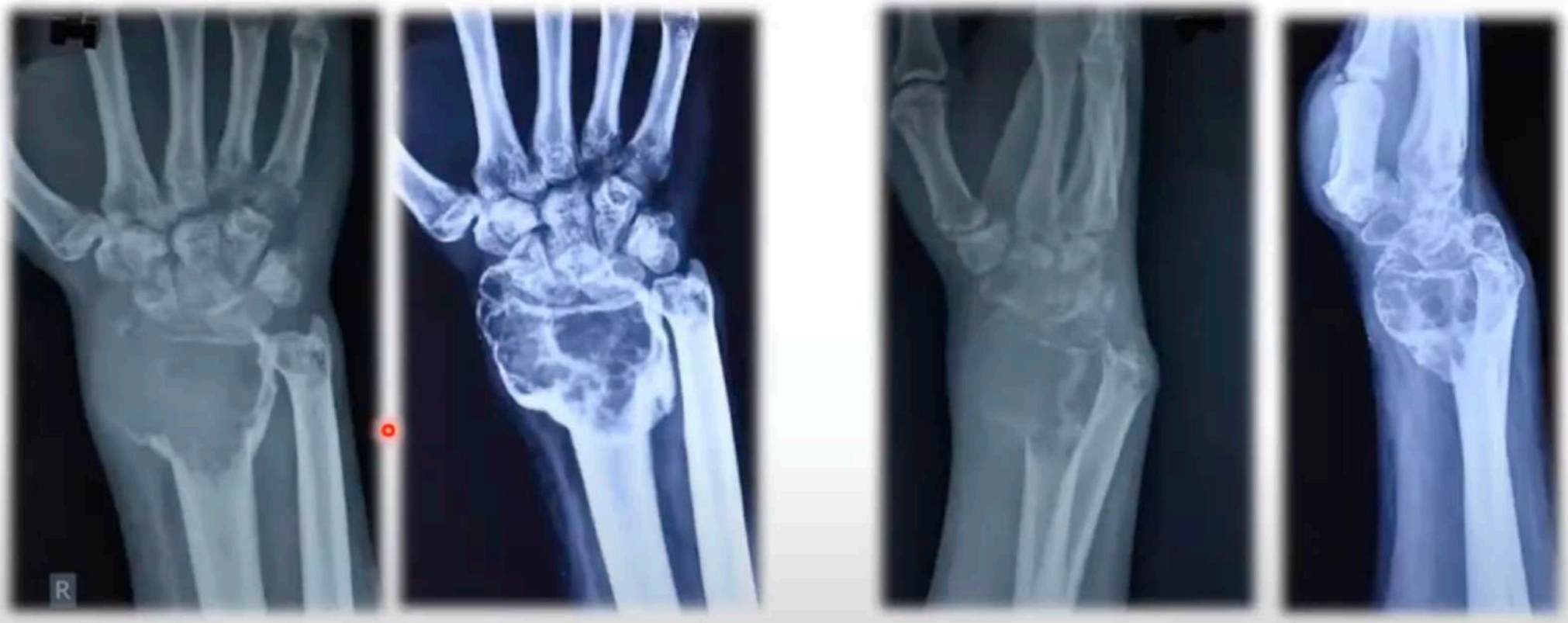
Lancet Oncol 2010; 11: 275–80

Published Online February 10, 2010 DOI:10.1016/S1470-2045(10)70010-3

See Reflection and Reaction page 218

Peter MacCallum Cancer Centre, East Melbourne, VIC, Australia (D Thomas FRACP); Washington Cancer Institute, Georgetown University School of Medicine, Washington, DC, USA (R Henshaw MD); Division of Hematology, Oncology, and Transplantation and Masonic Cancer Center, University of Minnesota, Minneapolis, MN, USA (Prof K Skubitz MD); Sarcoma Oncology Center, Santa Monica, CA, USA (S Chawla MD); University of Pennsylvania School of Medicine, Philadelphia, PA,

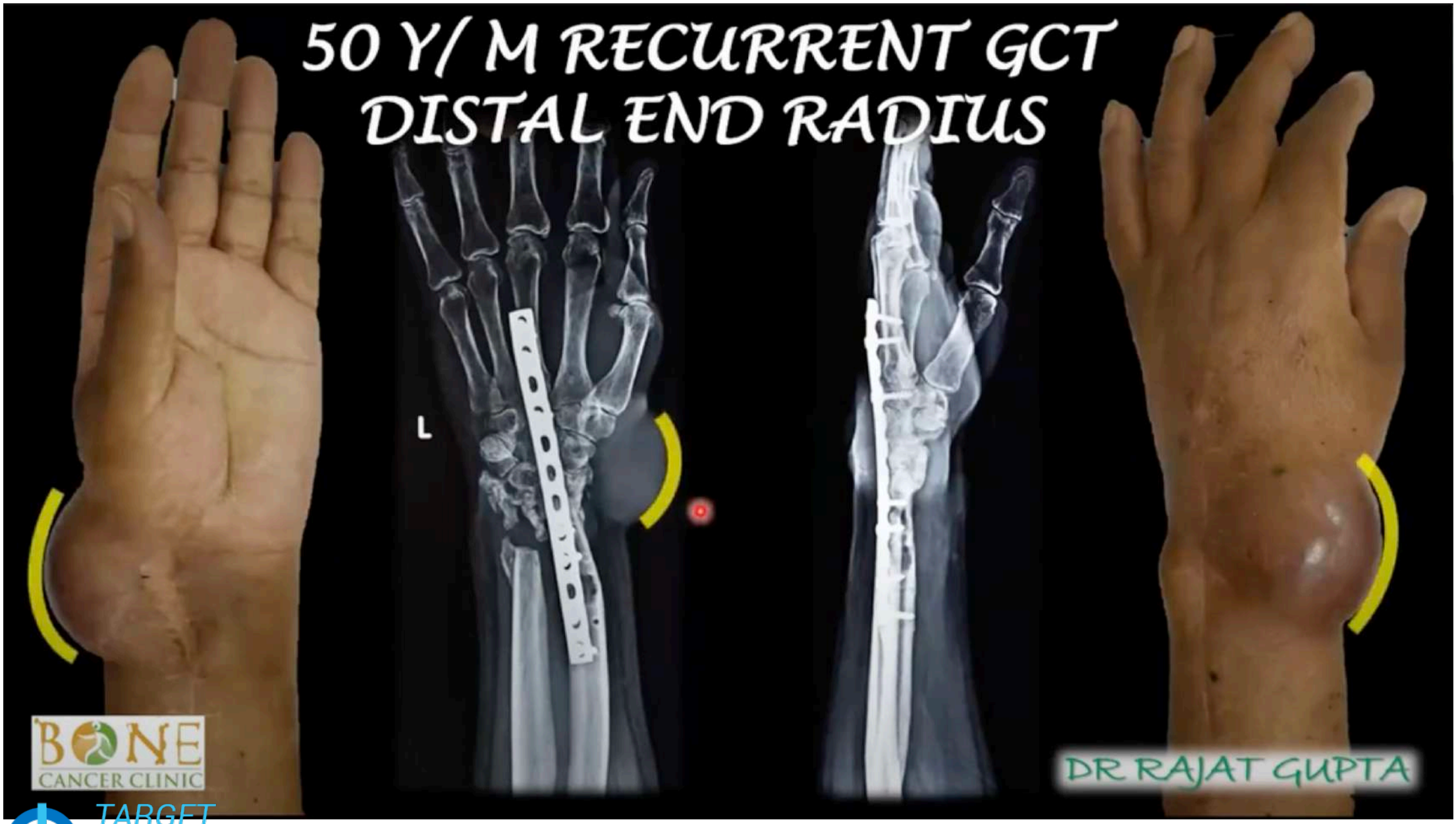
GIANT CELL TUMOUR

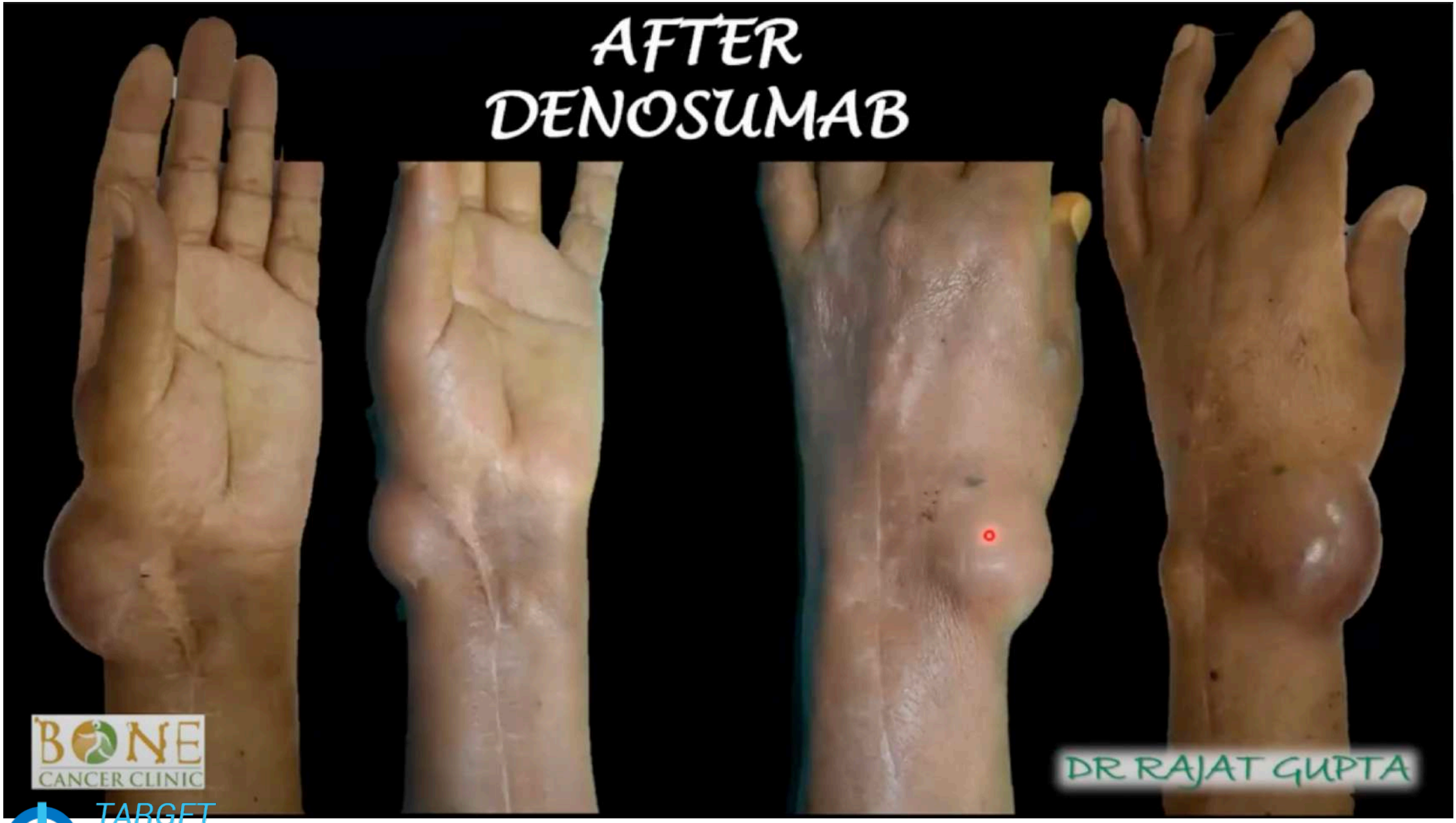


POST DENOSUMAB

DR RAJAT GUPTA

BONE CANCER CLINIC





Denosumab May Increase the Risk of Local Recurrence in Patients with Giant-Cell Tumor of Bone Treated with Curettage

Costantino Errani, MD, PhD, Shinji Tsukamoto, MD, PhD, Giulio Leone, MD, Alberto Righi, MD, PhD, Manabu Akahane, MD, PhD, Yasuhito Tanaka, MD, PhD, and Davide Maria Donati, MD, PhD

Investigation performed at the Departments of Orthopaedic Oncology and Pathology, Rizzoli Institute, Bologna, Italy

Background: Recent clinical studies have suggested that denosumab is associated with tumor response and reduced surgical morbidity in patients with giant-cell tumor of bone (GCTB). We therefore evaluated the recurrence-free survival rate of patients who had GCTB in an extremity and were treated with surgery and denosumab, to determine the influence of denosumab and clinical factors on the risk of local recurrence.

Methods: We retrospectively reviewed the medical records of 408 patients treated for GCTB in an extremity in a single institution from 1990 through 2013. Two hundred and forty-seven patients underwent curettage (intralesional surgery) with a high-speed burr, and 161 underwent resection. Phenol adjuvant was used in 221 of the 247 patients who had curettage. We also reviewed the medical records of 30 patients treated surgically (25 with curettage and 5 with resection) and with denosumab from 2010 through 2013 and compared their clinical results with 378 historical control subjects. The overall minimum duration of follow-up was 24 months.

Results: The local recurrence rates were 60% (15) of 25 patients treated with curettage and denosumab and 16% (36) of 222 patients treated with curettage alone. The joint preservation rates were 80% (20) of 25 patients treated with curettage and denosumab and 94% (209) of 222 patients treated with curettage alone. Univariate and multivariable analyses showed that denosumab was the only independent factor associated with a poor prognosis when recurrence-free survival and joint preservation were considered. The overall median duration of follow-up was 85.6 months (interquartile range, 54.3 to 125.1 months). Viable tumor was present in all 30 specimens from patients treated with denosumab.

Conclusions: There was a higher rate of recurrence in the cohort exposed to denosumab. Because there were substantial differences in the cohorts and randomization was not applied, however, causation could not be evaluated.

Effects of Denosumab

Pre-operative

- Significant improvement in pain after 3-4 doses

Operative

- Hardened shell - easier handling and dissection
- Reduction in vascularity - decreased blood loss

BONE CANCER CLINIC

DR RAJAT GUPTA

Denosumab May Increase the Risk of Local Recurrence in Patients with Giant-Cell Tumor of Bone Treated with Curettage

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DOI: HTTPS://DOI.ORG/10.5114/PJP.2016.65873 POL J PATHOL 2016; 67 (4): 392-397

ORIGINAL PAPER

MORPHOLOGIC EVALUATION OF THE EFFECT OF DENOSUMAB ON GIANT CELL TUMORS OF BONE AND A NEW GRADING SCHEME

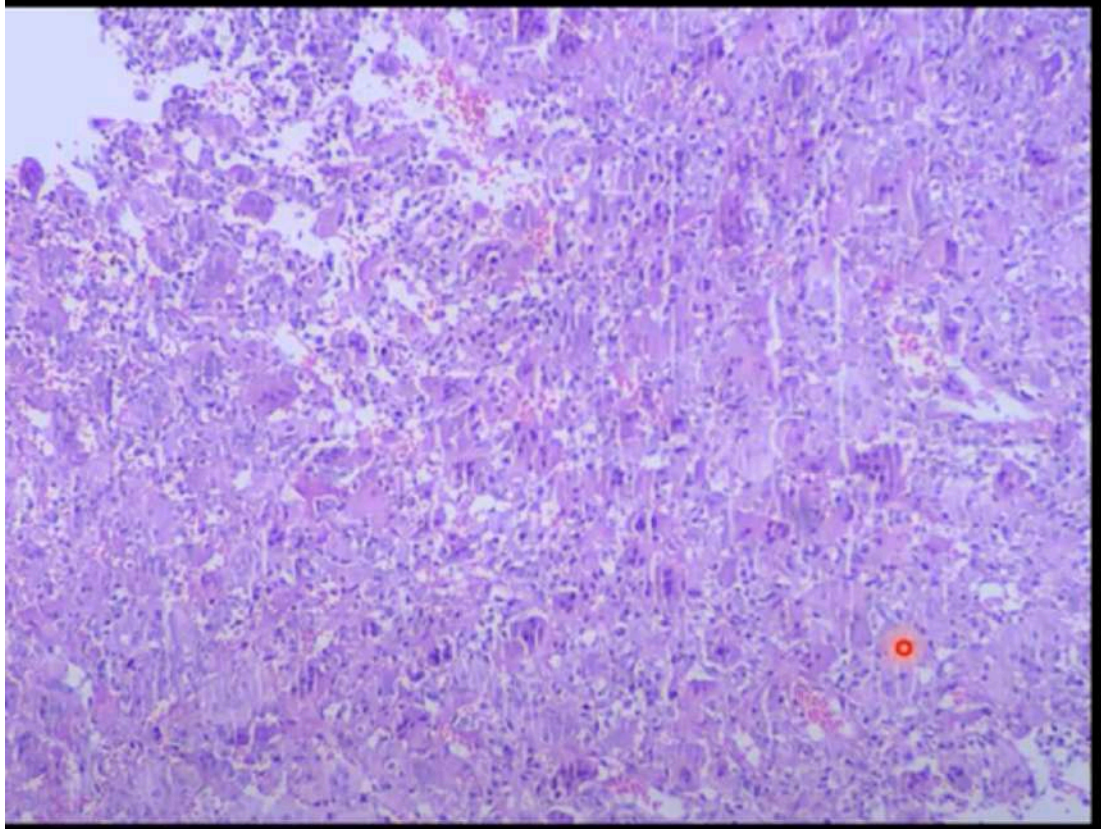
Pathol. Oncol. Res.
DOI 10.1007/s12253-016-0123-0

ORIGINAL ARTICLE

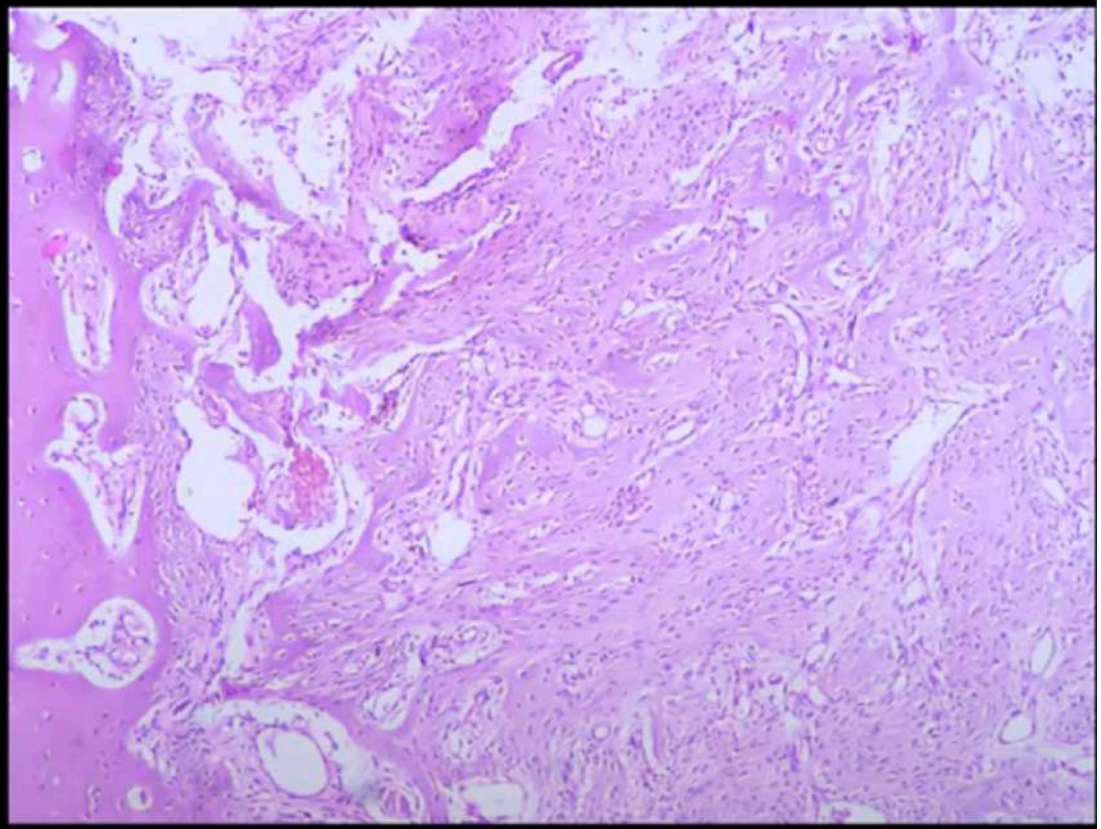
Clinicopathological Features of a Series of 27 Cases of Post-Denosumab Treated Giant Cell Tumors of Bones: A Single Institutional Experience at a Tertiary Cancer Referral Centre, India

Bharat Rekhi[1] · Vivek Verma[2] · Ashish Gulia[2] · Nirmala A. Jambhekar[1] · Subhash Desai[3] · Shashikant L. Juvekar[3] · Jyoti Bajpai[4] · Ajay Puri[2]

PRE DENOSUMAB



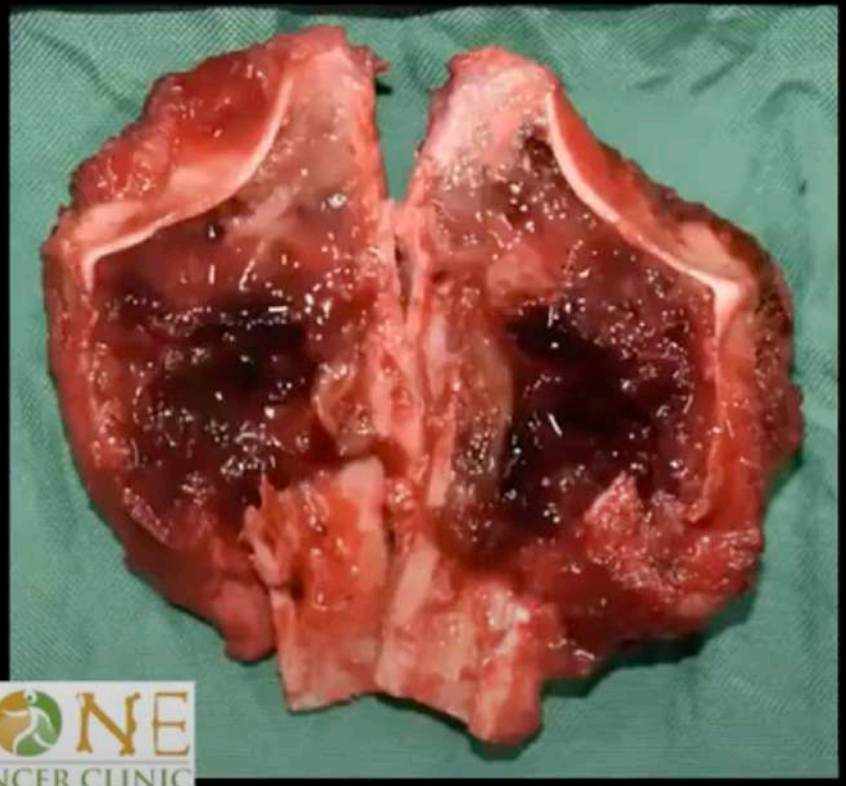
POST DENOSUMAB



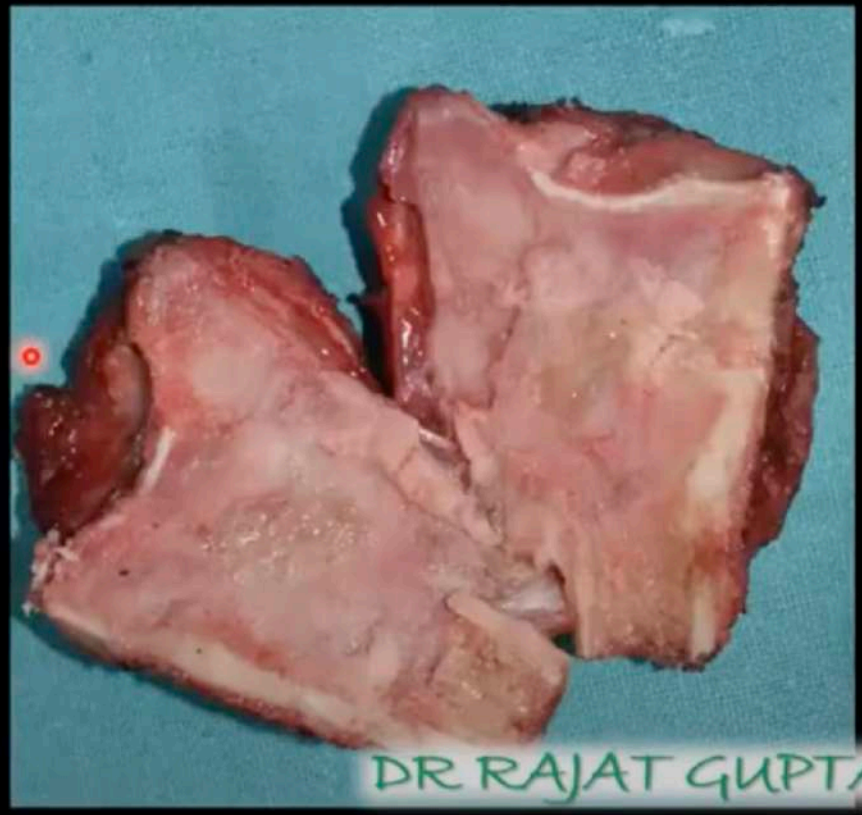
BONE CANCER CLINIC

DR RAJAT GUPTA

WITHOUT DENOSUMAB



WITH DENOSUMAB



NO ROLE OF DENOSUMAB IN ADJUVANT SETTING TO DECREASE RECURRENCE

A Translational Study of the Neoplastic Cells of Giant Cell Tumor of Bone Following Neoadjuvant Denosumab

Isabella W.Y. Mak, MSc*, Nathan Evaniew, MD*, Snezana Popovic, MD, Richard Tozer, MD, and Michelle Ghert, MD

Investigation performed at the Departments of Surgery, Pathology and Molecular Science, and Oncology, McMaster University, Hamilton, and the Juravinski Cancer Centre, Hamilton Health Sciences, Hamilton, Ontario, Canada

Background: Giant cell tumor of bone is a primary bone tumor that is treated surgically and is associated with high morbidity in many cases. This tumor consists of giant cells expressing RANK (receptor activator of nuclear factor-κB) and mesenchymal spindle-like stromal cells expressing RANKL (RANK ligand); the interaction of these cells leads to bone resorption. Denosumab is a monoclonal antibody that binds RANKL and directly inhibits osteoclastogenesis. Clinical studies have suggested clinical and histological improvement when denosumab was administered to patients with a giant cell tumor. However, no studies have yet examined the viability and functional characteristics of tumor cells following denosumab treatment.

Methods: Specimens were obtained from six patients with a histologically confirmed giant cell tumor. Two of the patients had been treated with denosumab for six months. Primary cultures of stromal cells from fresh tumor tissue were established. Cell proliferation was measured over a two-day time course. The expression of RANKL and osteoprotegerin was analyzed with use of real-time PCR (polymerase chain reaction).

Results: Histological specimens from both patients who had completed denosumab treatment showed the absence of giant cells but persistence of stromal cells. Cell proliferation studies indicated that proliferation of stromal cells cultured from clinical specimens following denosumab treatment was approximately 50% slower than that of specimens from untreated patients. The expression of RANKL in the specimens from the treated patients was almost completely eliminated.

Conclusions: Once the giant cell tumor tissue was no longer exposed to denosumab, the stromal cells continued to proliferate in vitro, albeit to a lesser degree. However, they also showed almost complete loss of RANKL expression.

Clinical Relevance: It is clear that treatment with denosumab only partially addresses the therapeutic need of patients with a giant cell tumor by wiping out the osteoclasts but leaving the neoplastic stromal cells proliferative.

Case Reports in Medicine
Volume 2015, Article ID 767198, 6 pages
http://dx.doi.org/10.1155/2015/767198

Hindawi

Case Report

Two Cases of Sarcoma Arising in Giant Cell Tumor of Bone Treated with Denosumab

Cory Julian Broehm,[1] Erika L. Garbrecht,[2] Jeff Wood,[3] and Therese Bocklage[1]

[1]*Department of Pathology, University of New Mexico School of Medicine, MSC08 4640, 1 University of New Mexico, Albuquerque, NM 87131, USA*
[2]*Department of Orthopaedics, University of New Mexico School of Medicine, MSC10 5600, Albuquerque, NM 87131, USA*
[3]*Department of Radiology, University of New Mexico School of Medicine, MSC10 5530, 1 University of New Mexico, Albuquerque, NM 87131, USA*

Clin Orthop Relat Res (2015) 473:3050–3055
DOI 10.1007/s11999-015-4249-2

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CASE REPORT

A High-grade Sarcoma Arising in a Patient With Recurrent Benign Giant Cell Tumor of the Proximal Tibia While Receiving Treatment With Denosumab

Luis A. Aponte-Tinao MD, Nicolas S. Piuzzi MD, Pablo Roitman MD, German L. Farfalli MD

GIANT CELL TUMOUR

DENOSUMAB

- REDUCES PAIN
- DECREASES VASCULARITY
- EASES RESECTION
- MAY INCREASE RISK OF LOCAL RECURRENCE AFTER CURETTAGE
- NO ROLE IN ADJUVANT SETTING
- LONG TERM THERAPY IN UNRESECTABLE CASES
- NO CONSENSUS ON DOSING SCHEDULE

Clin Orthop Relat Res (2018) 0:1-10
DOI 10.1007/s11999.0000000000000243

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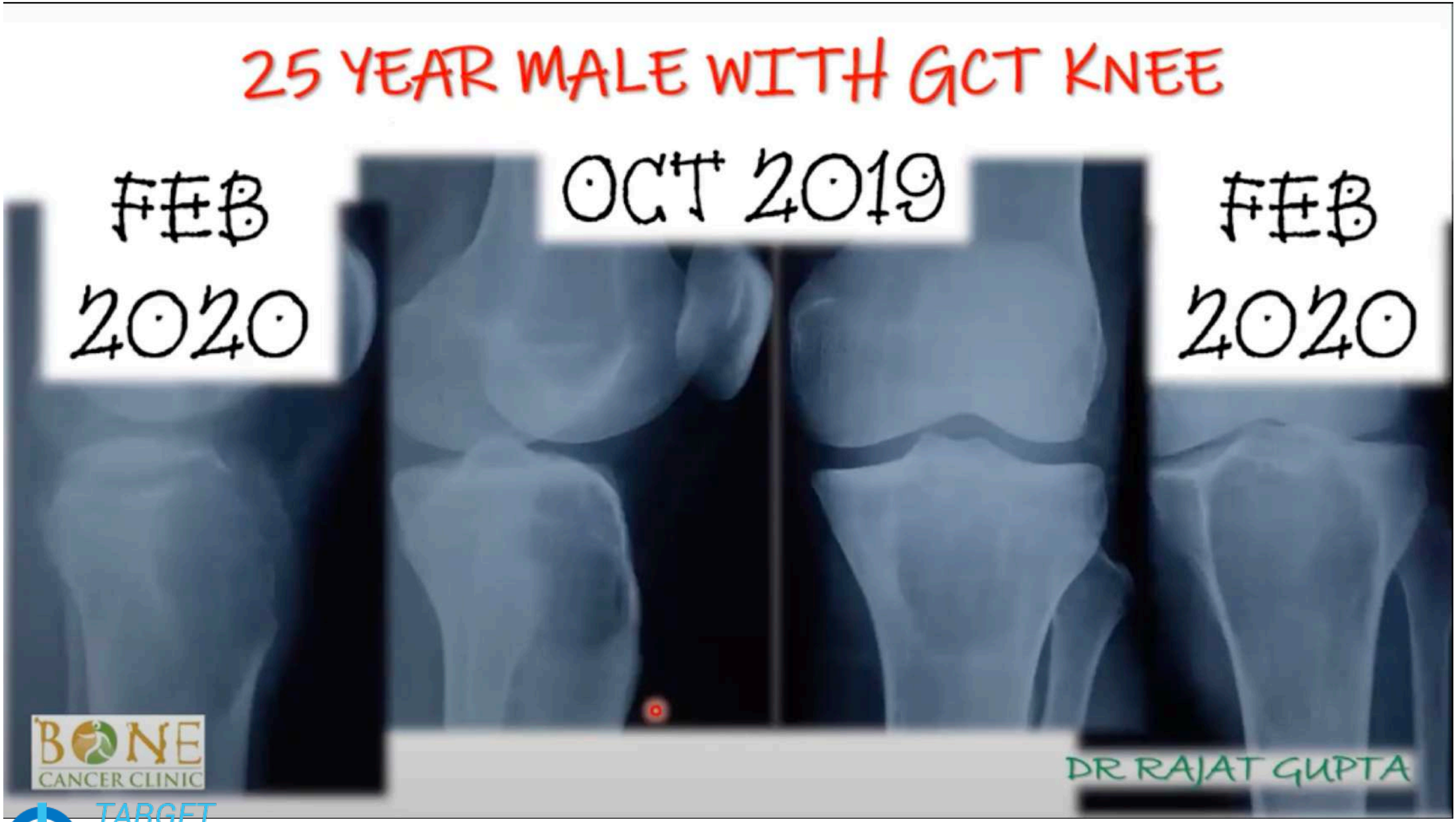
2017 International Society of Limb Salvage Proceedings

OPEN

Does Denosumab Change the Giant Cell Tumor Treatment Strategy? Lessons Learned From Early Experience

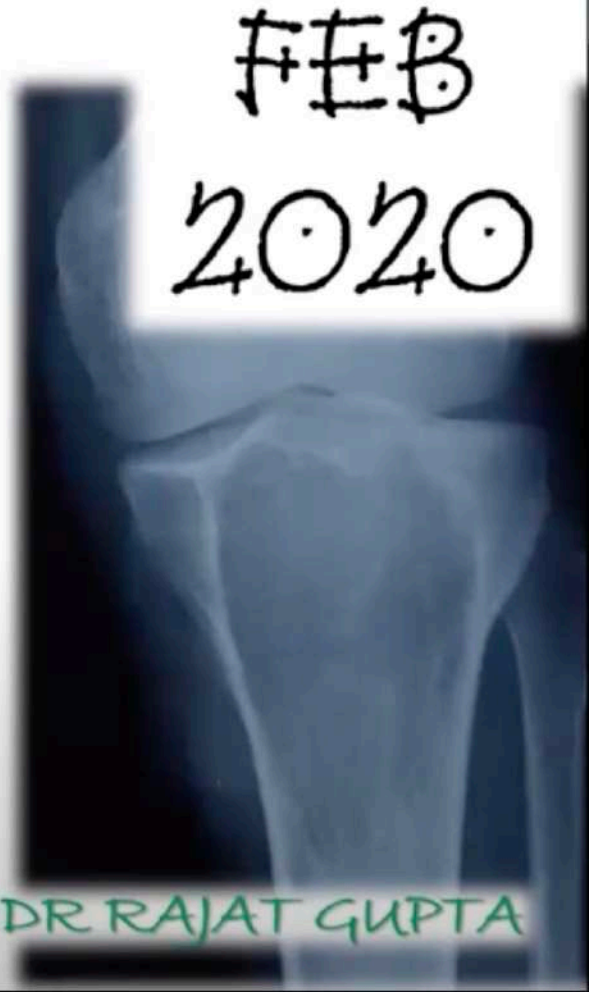
Manish G. Agarwal MS Orth, Manit K. Gundavda DNB Orth, Rajat Gupta MS Orth, Rajeev Reddy DNB Orth

25 YEAR MALE WITH GCT KNEE



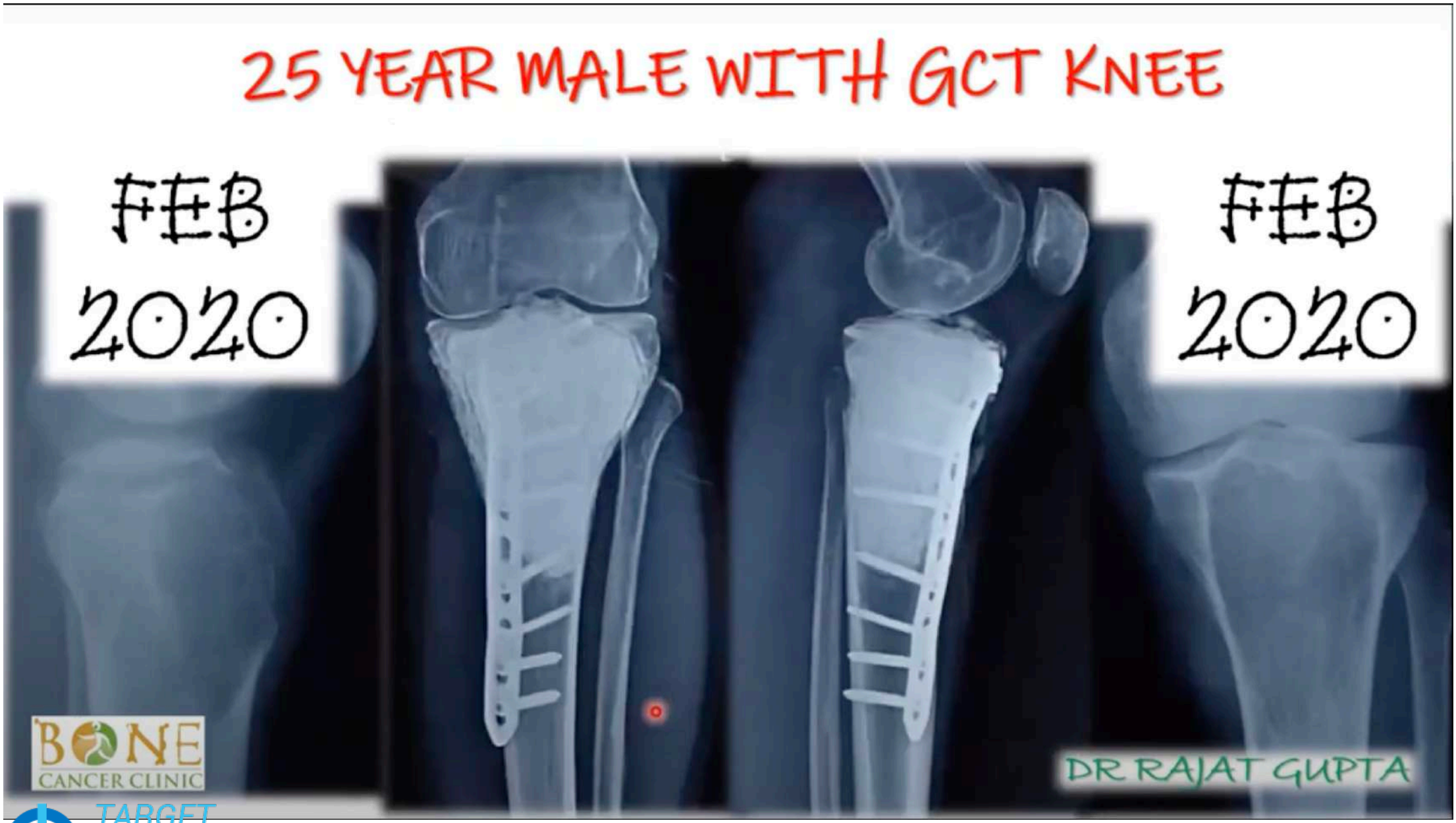
25 YEAR MALE WITH GCT KNEE

EXTENDED CURETTAGE & CEMENTING

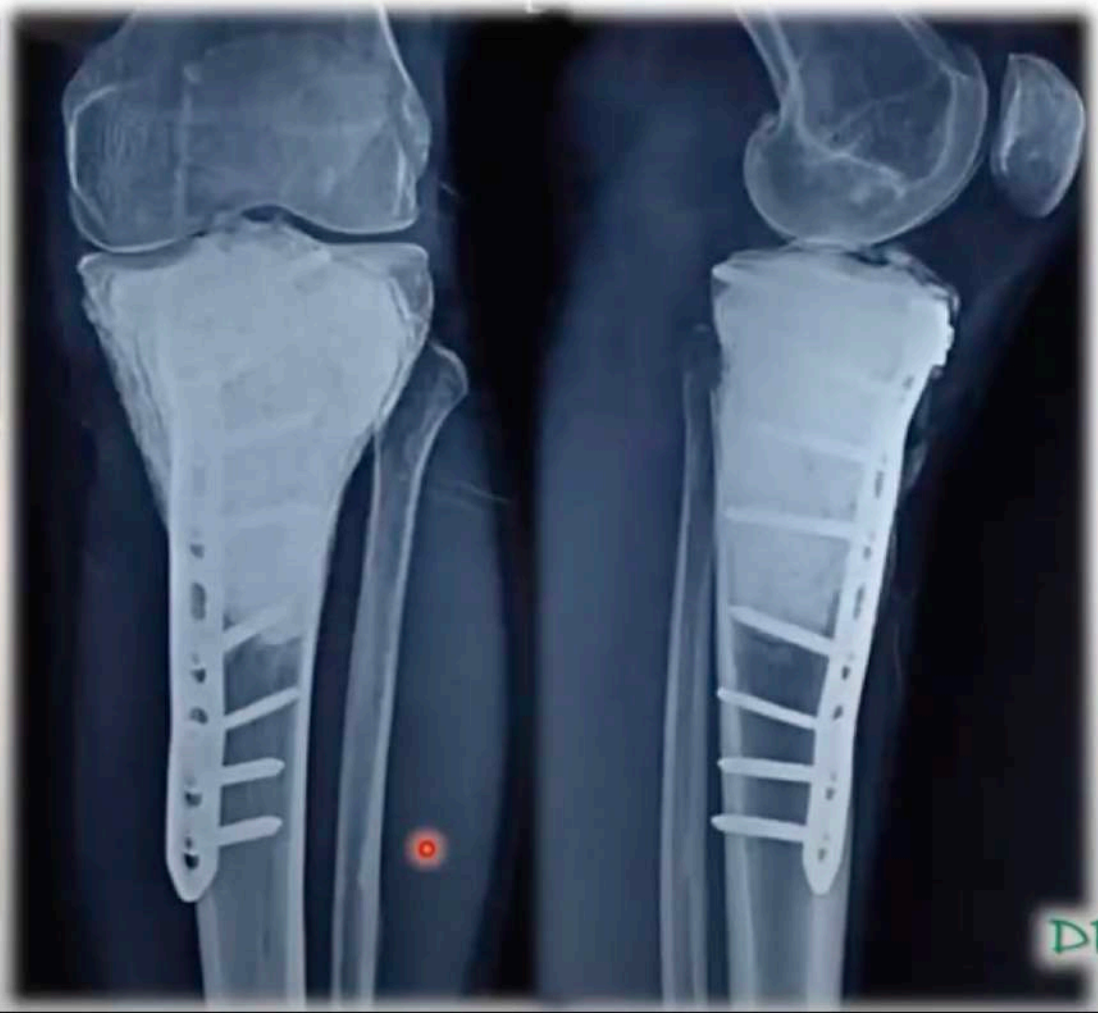


BONE CANCER CLINIC

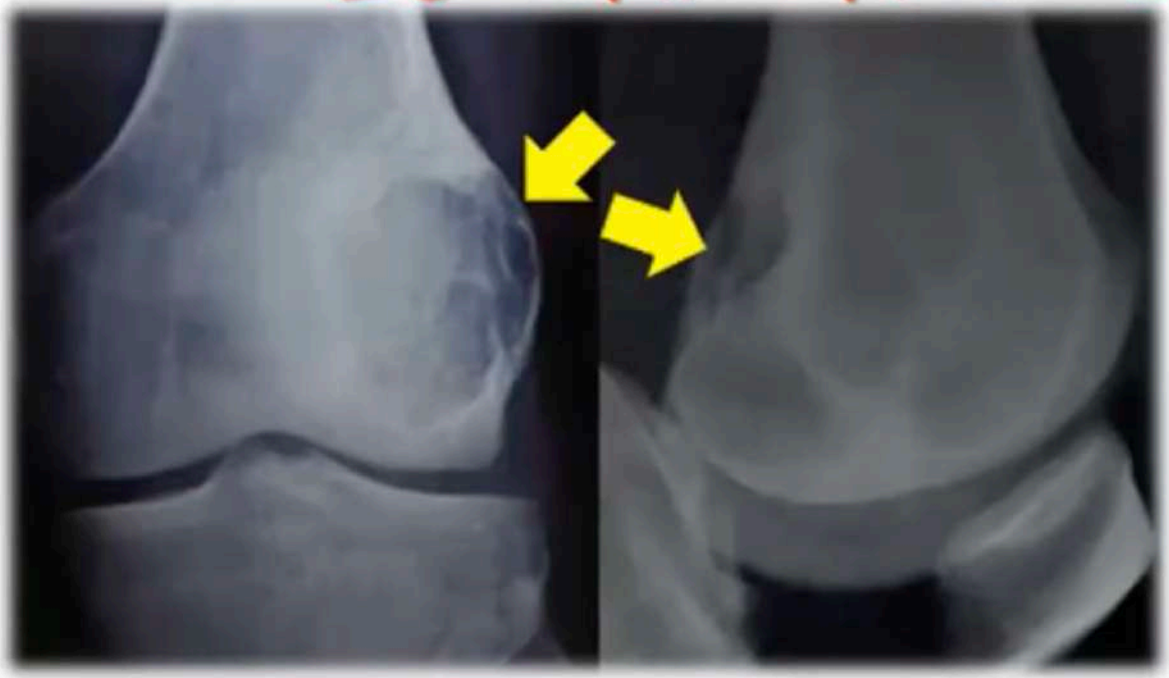
25 YEAR MALE WITH GCT KNEE

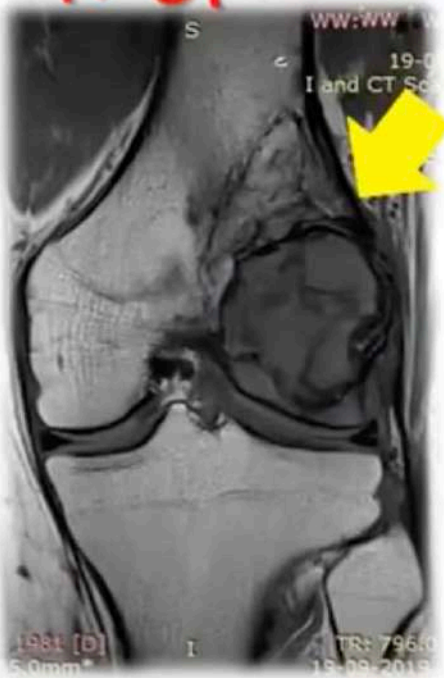


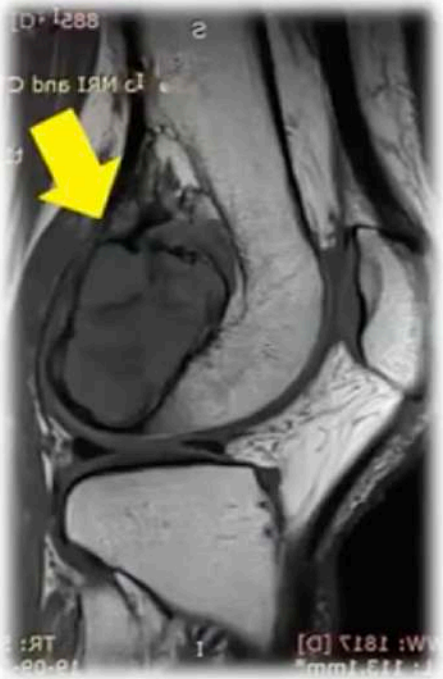
FUNCTION AT 18 MONTHS



28 YEAR MALE WITH GCT KNEE



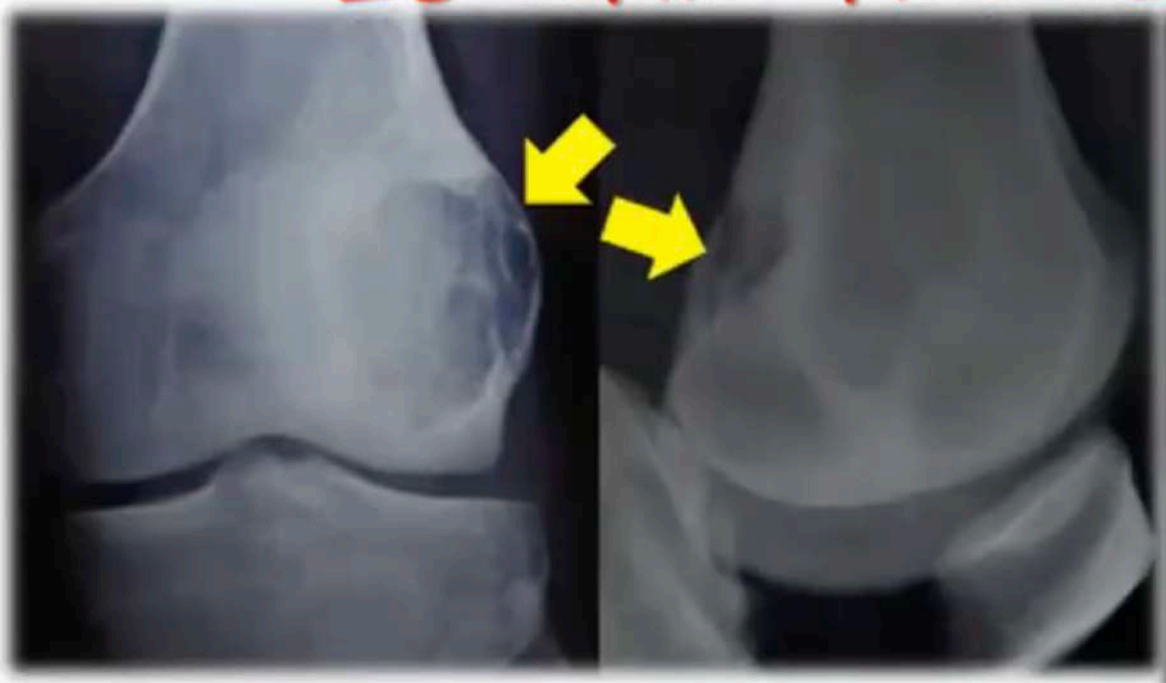


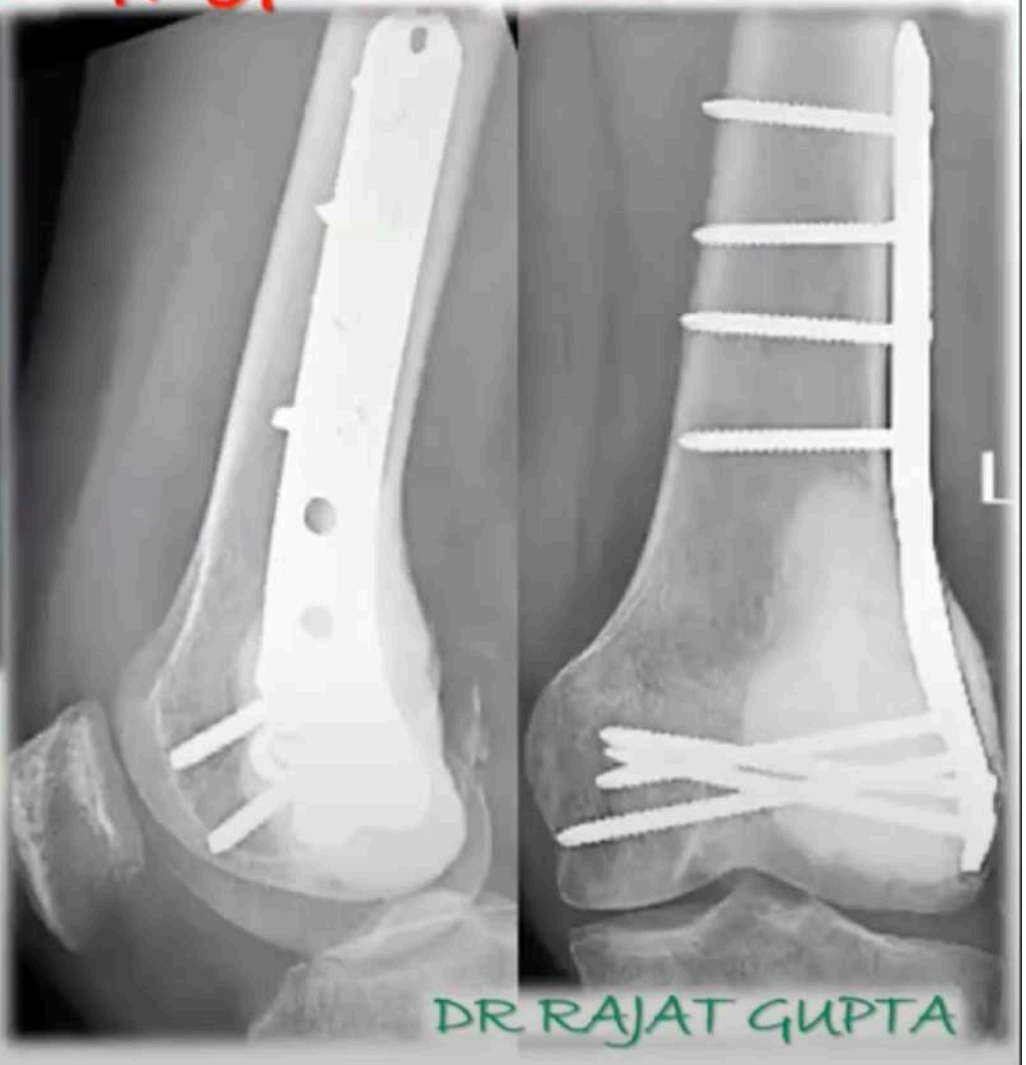


BONE CANCER CLINIC

DR RAJAT GUPTA

28 YEAR MALE WITH GCT KNEE

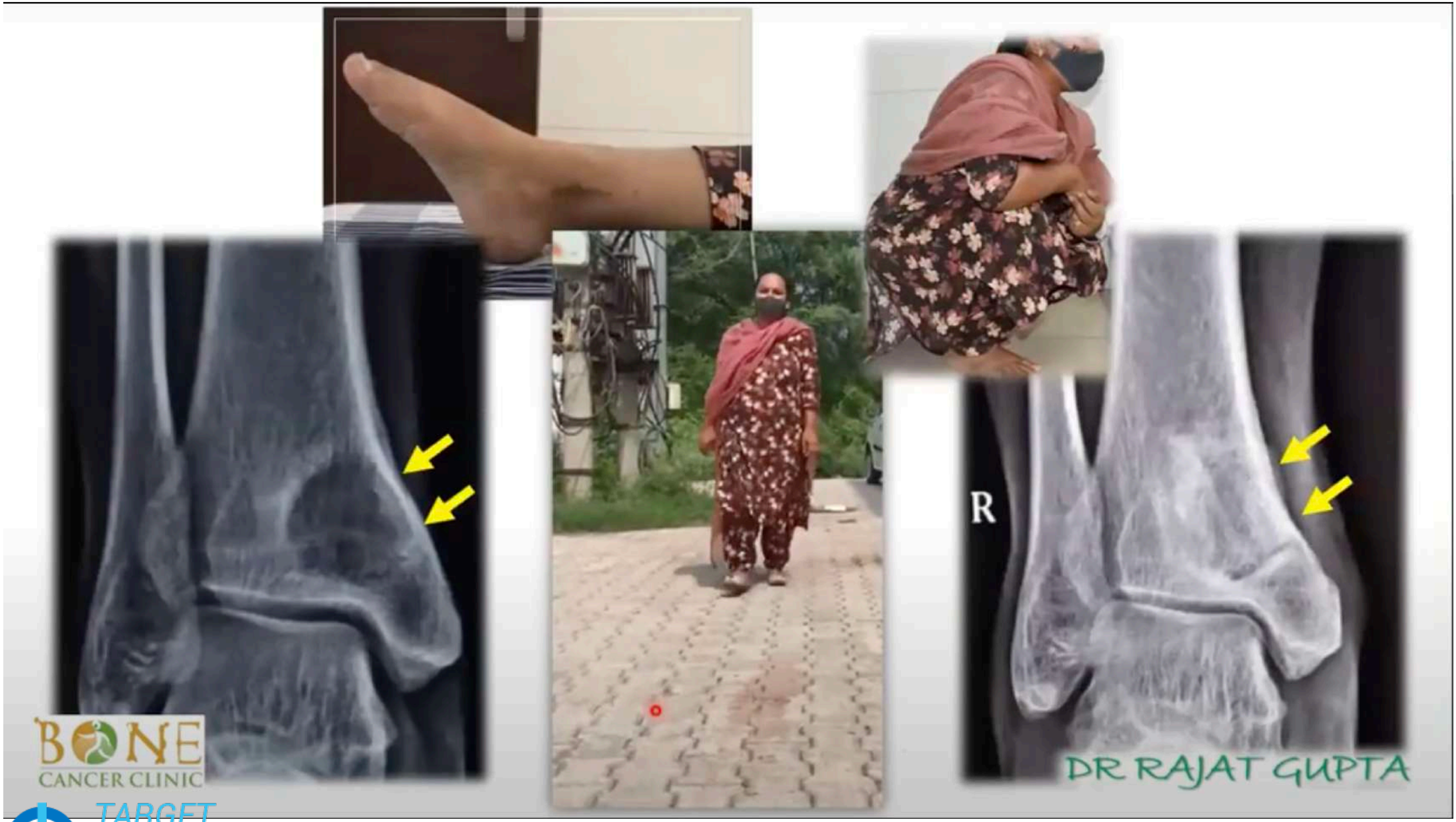




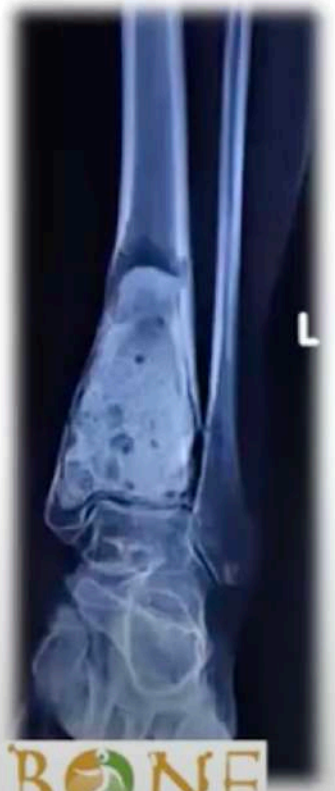
EXTENDED CURETTAGE & CEMENTING

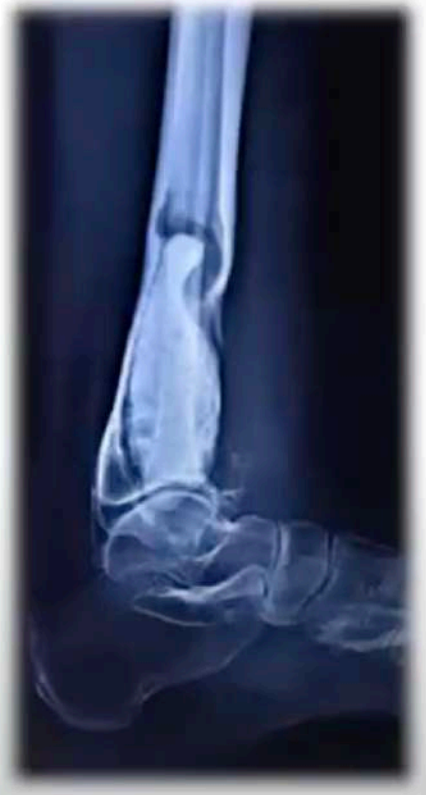
BONE CANCER CLINIC

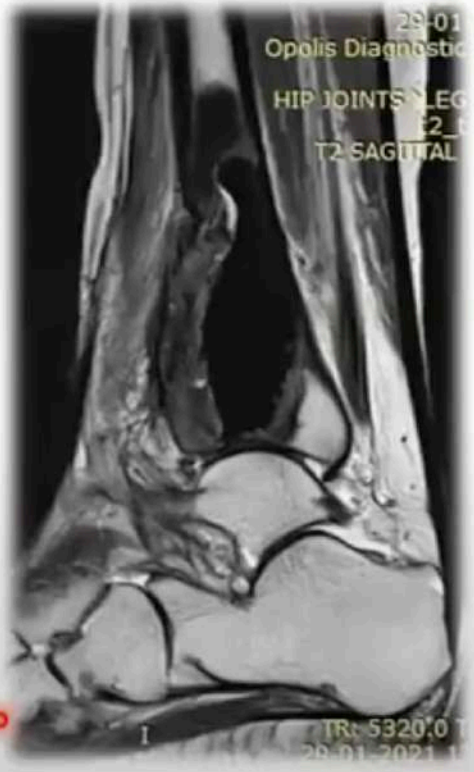
DR RAJAT GUPTA

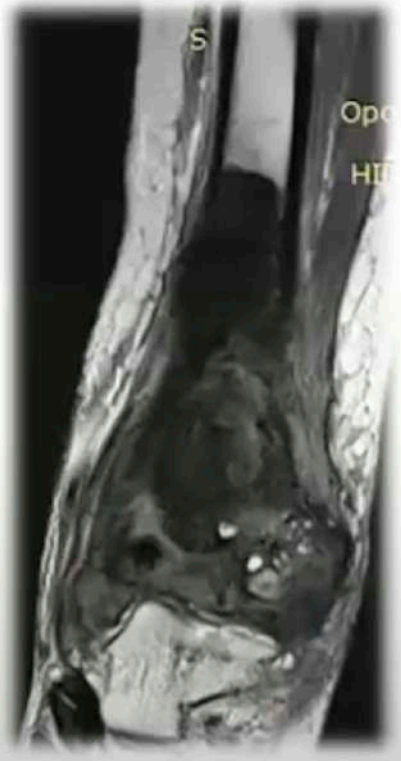


30y/F RECURRENT GCT DISTAL TIBIA



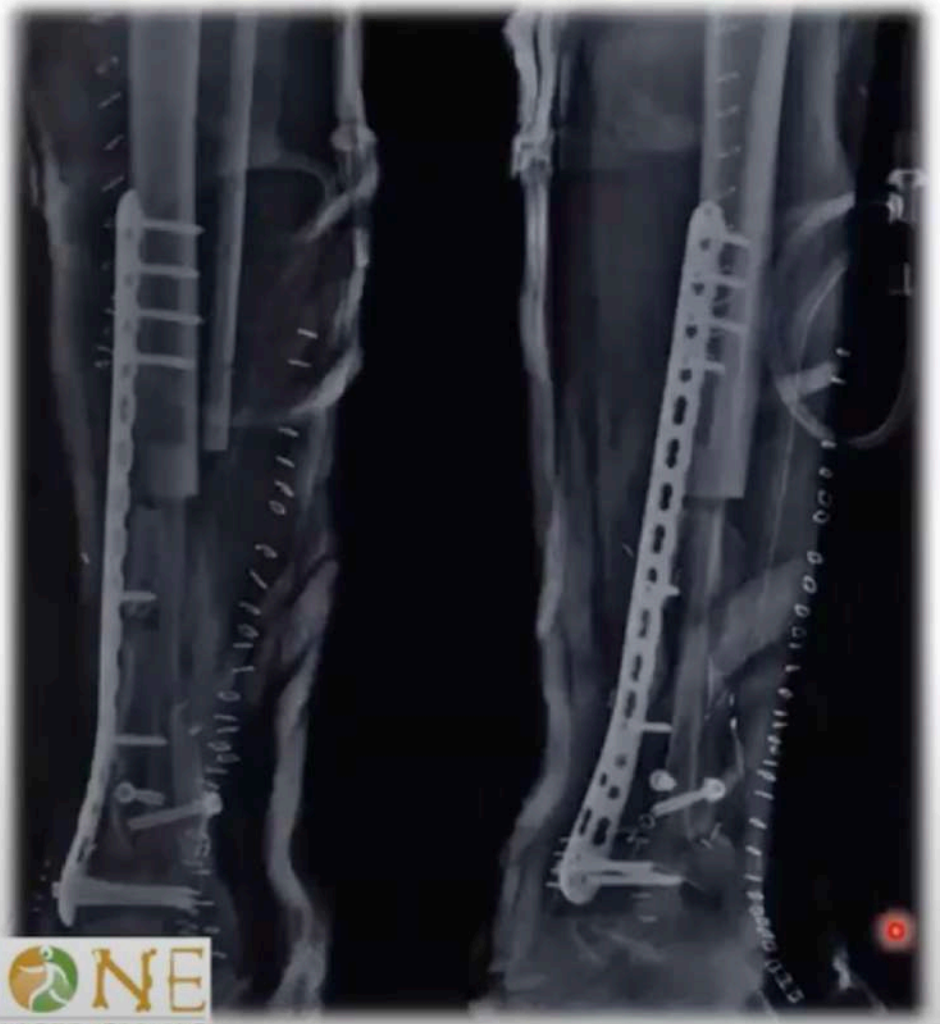






DR RAJAT GUPTA

BONE CANCER CLINIC



DISTAL TIBIA RESECTION

+

FROZEN AUTOGRAFT STERLISATION

+

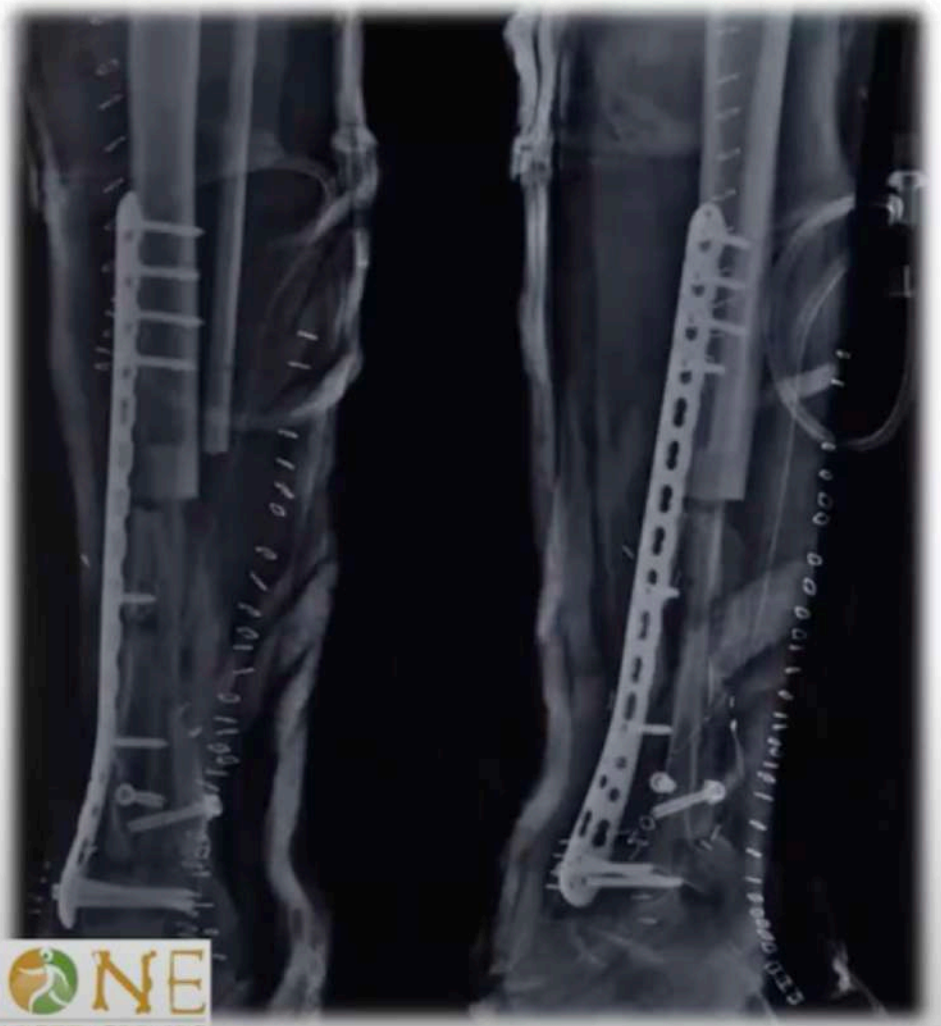
TIBIALISATION OF FIBULA

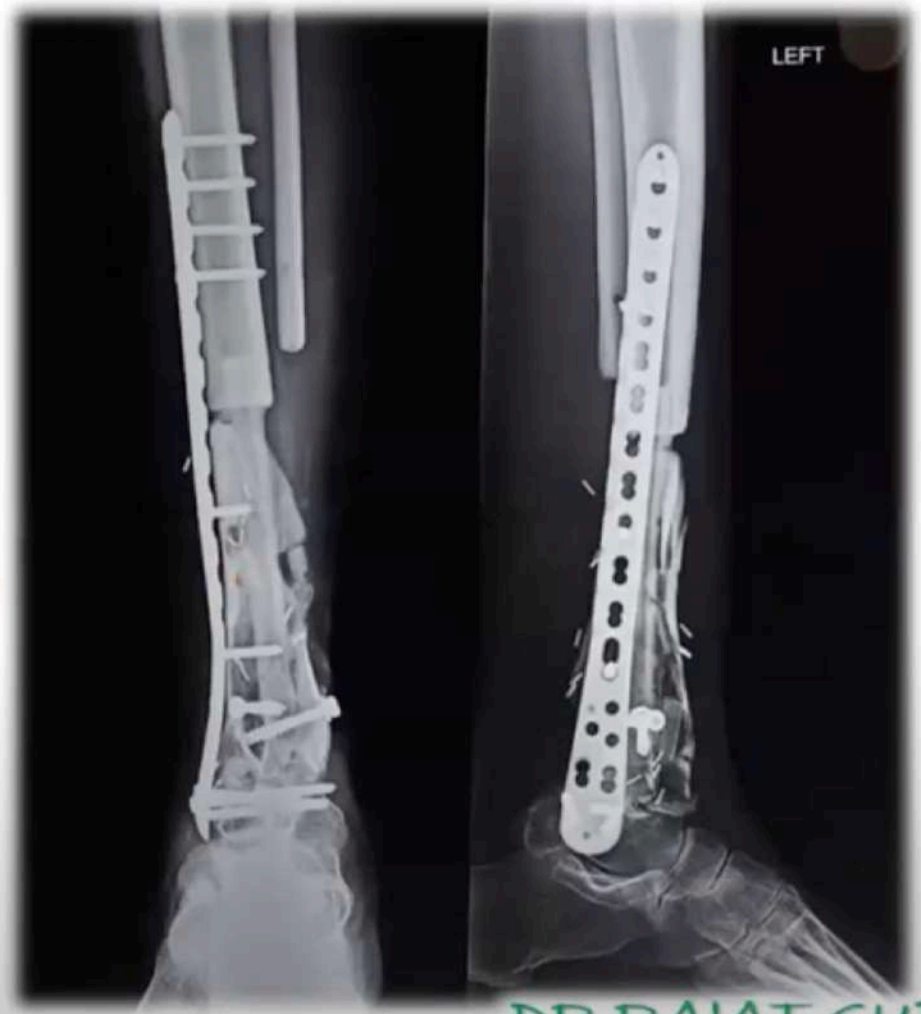
+

ILIAC CREST BONE GRAFTING

+

PLATING

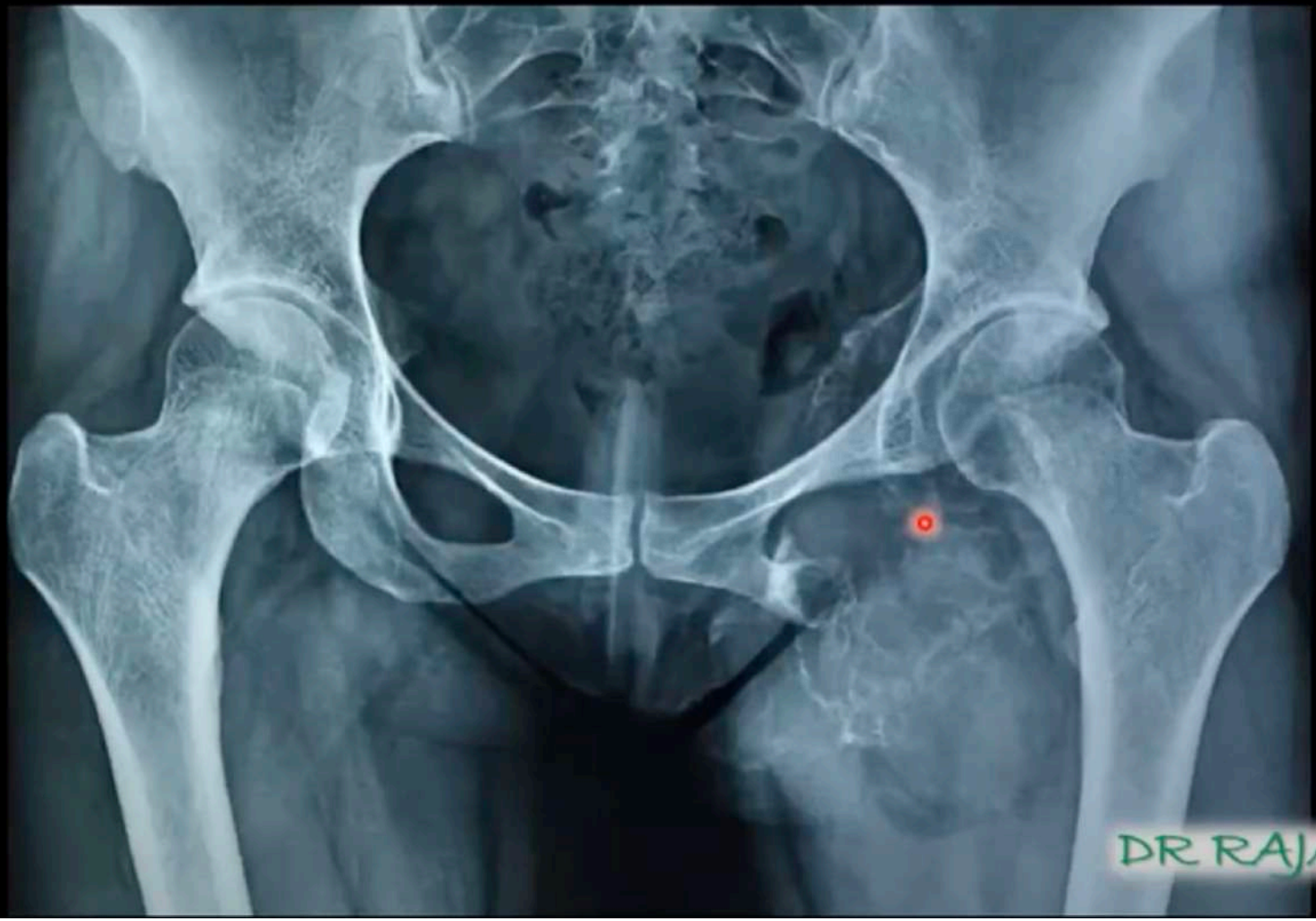




BONE CANCER CLINIC

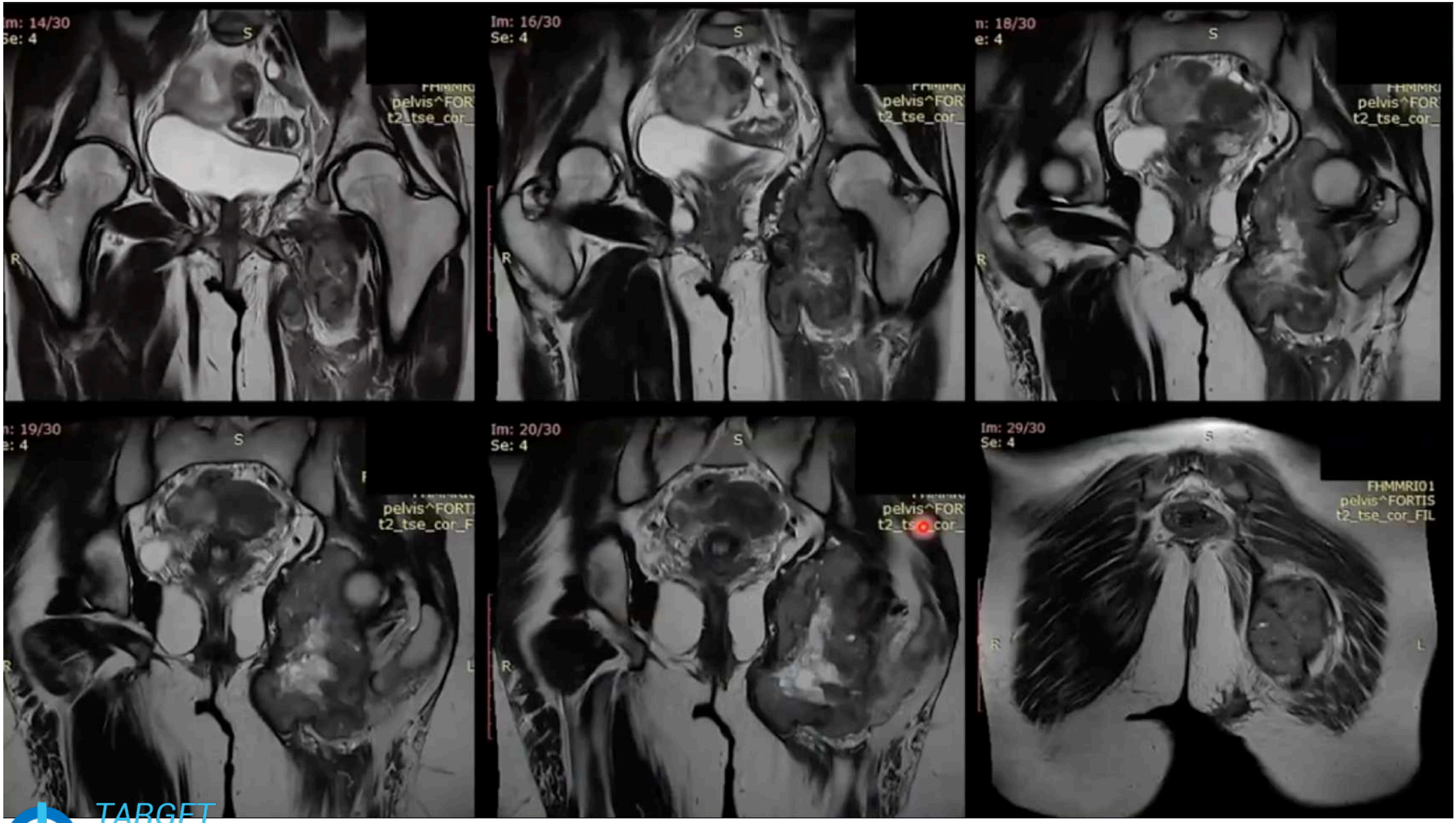
DR RAJAT GUPTA

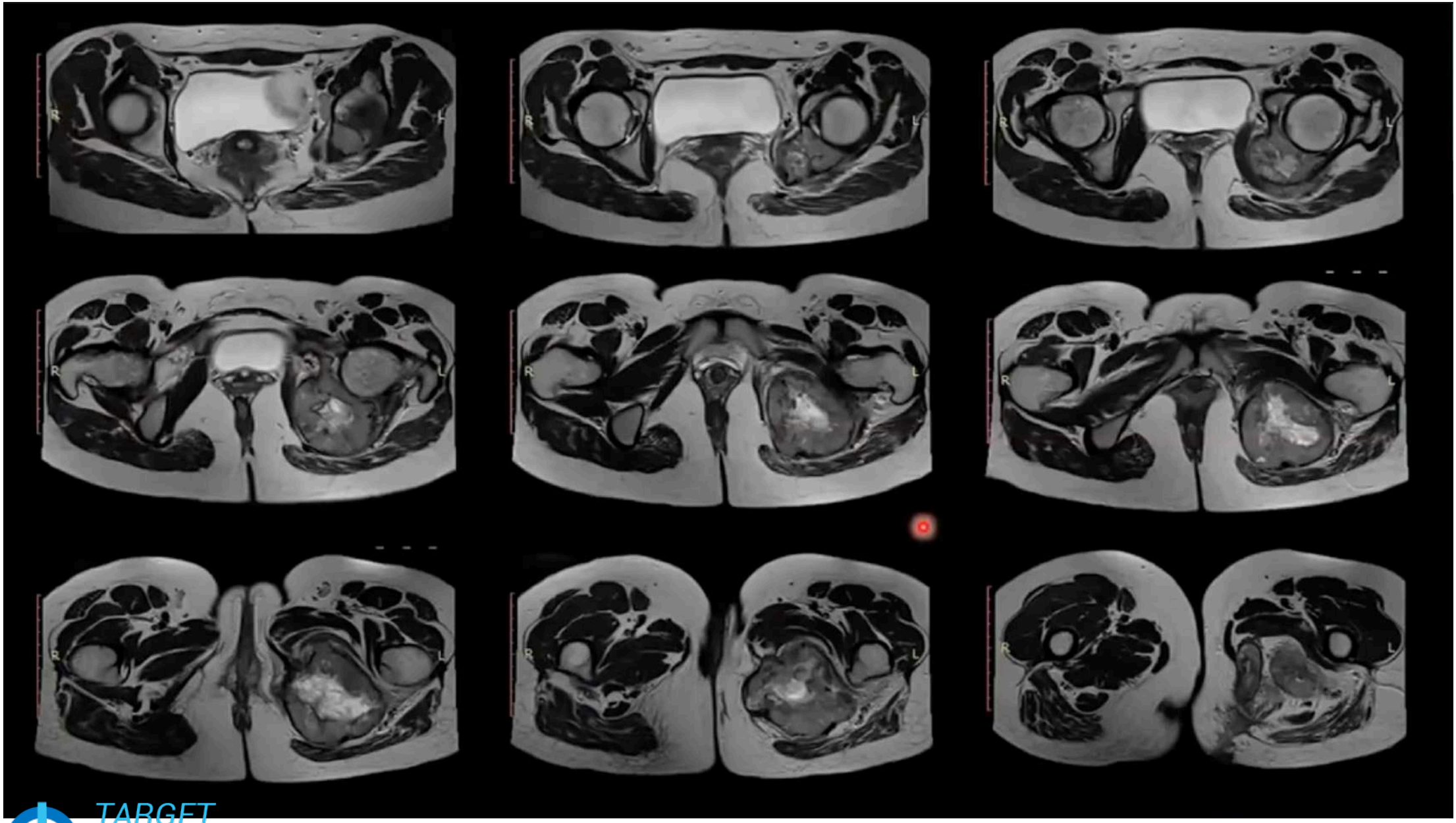
25Y /F RECURRENT GCT PELVIS

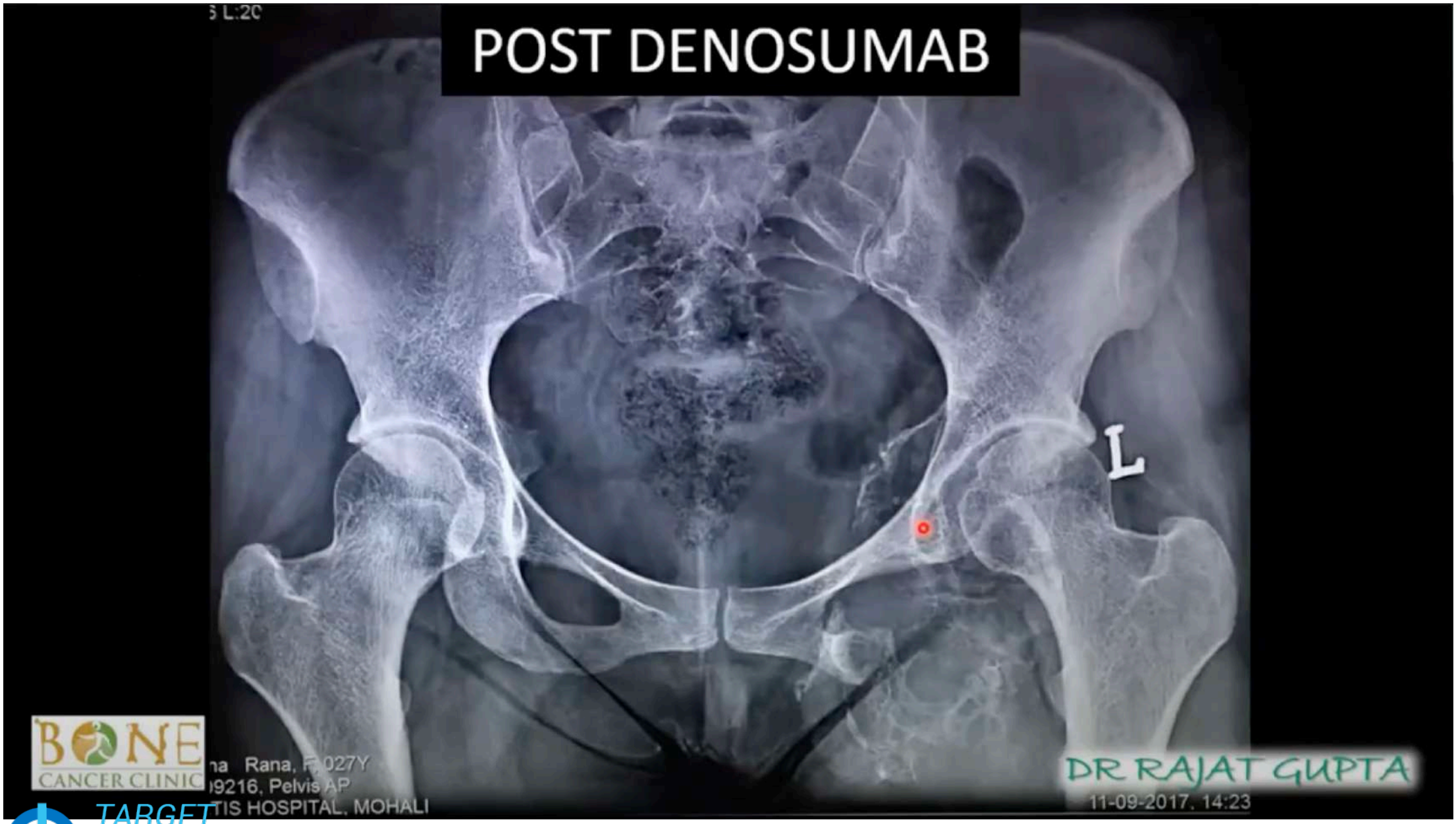


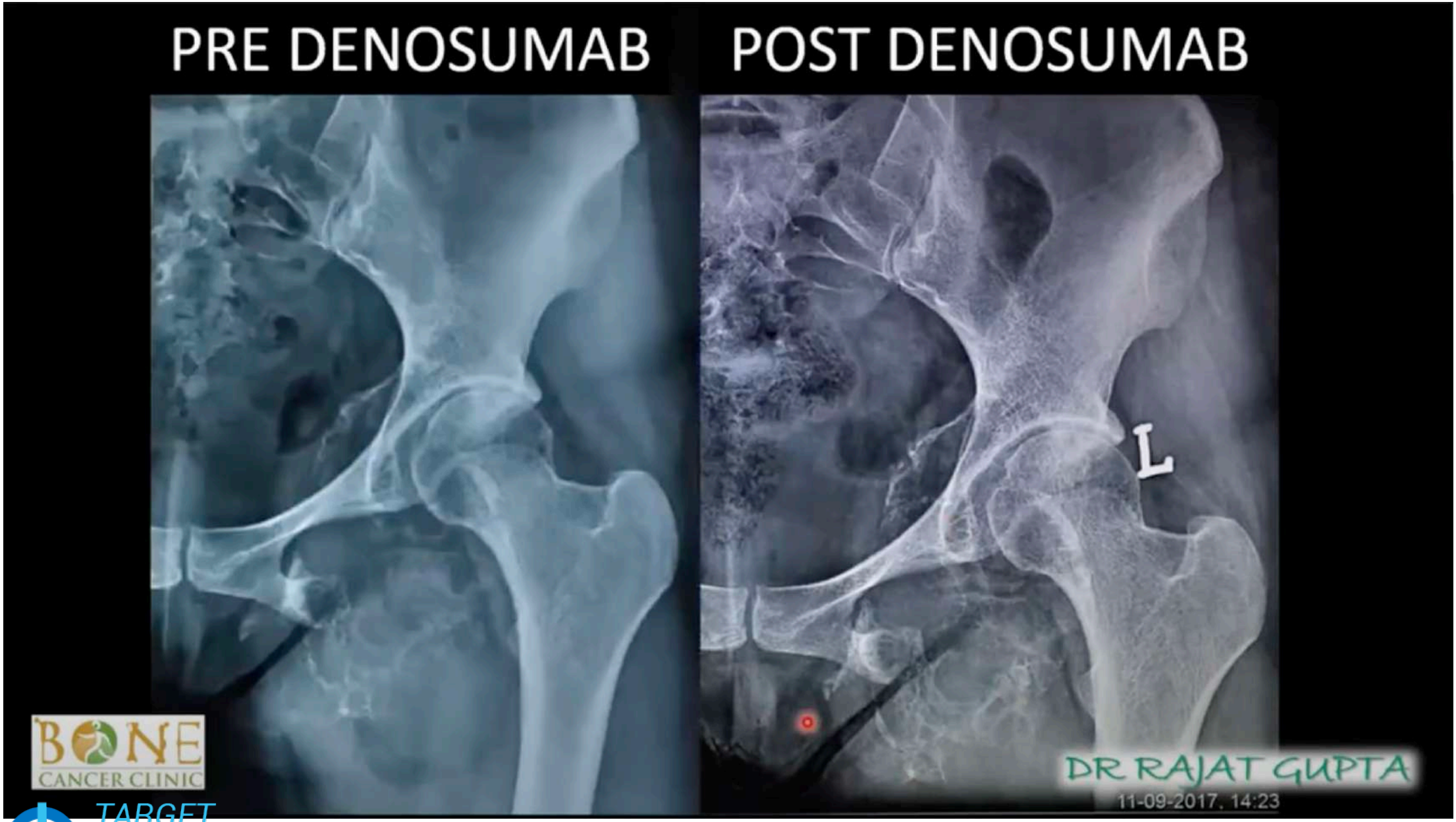
BONE CANCER CLINIC

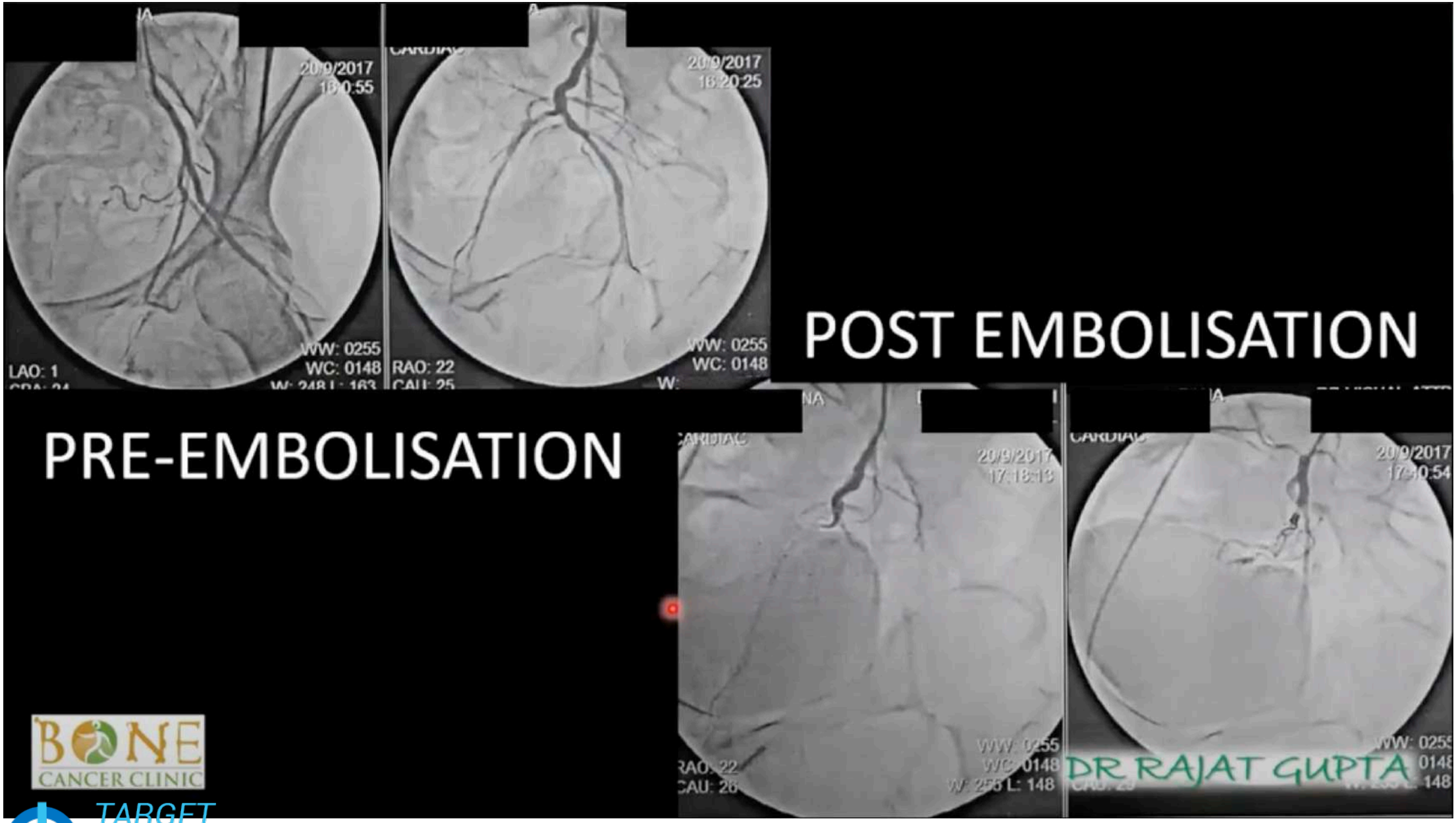
TARGET ORTHO











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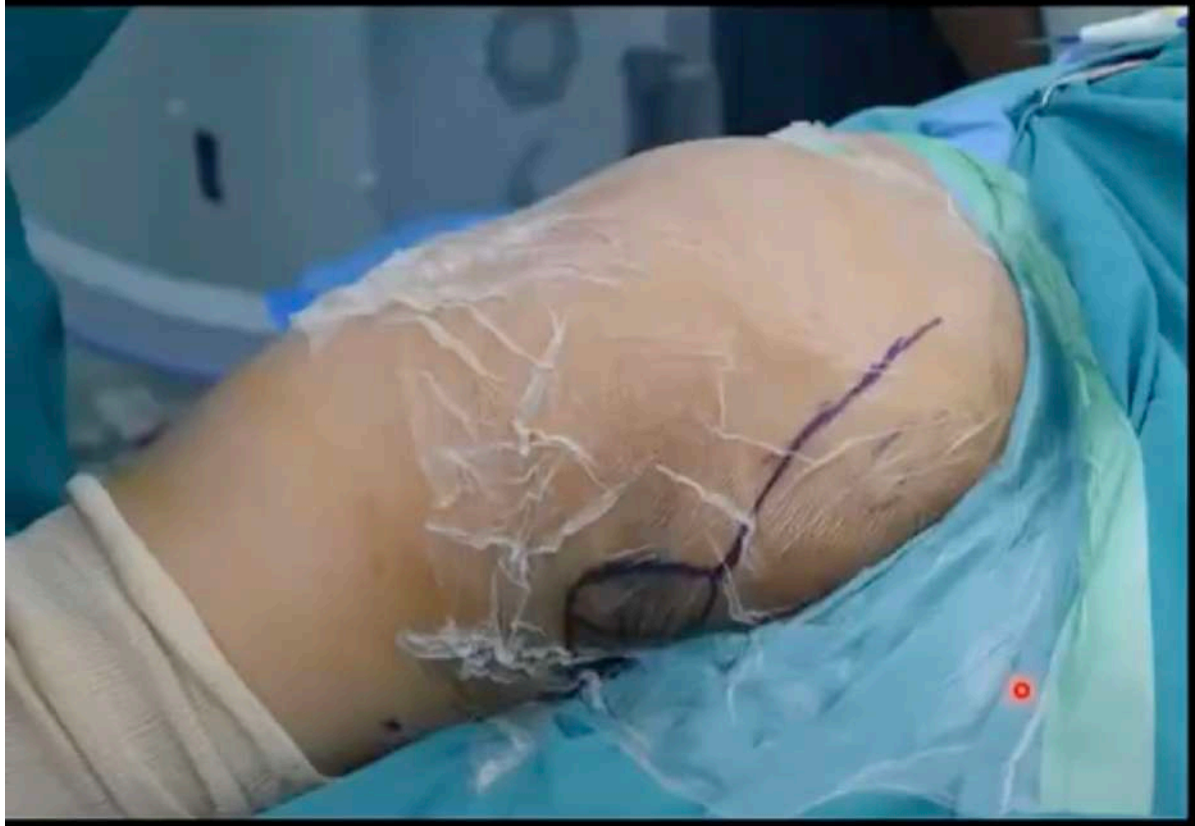
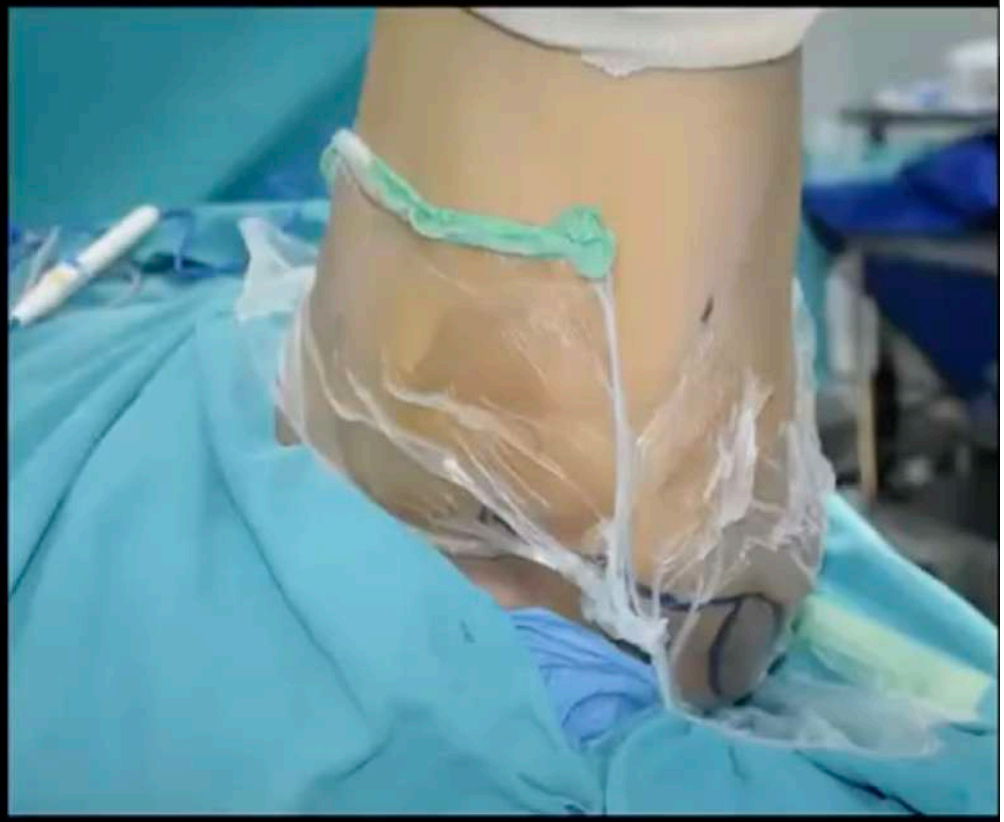
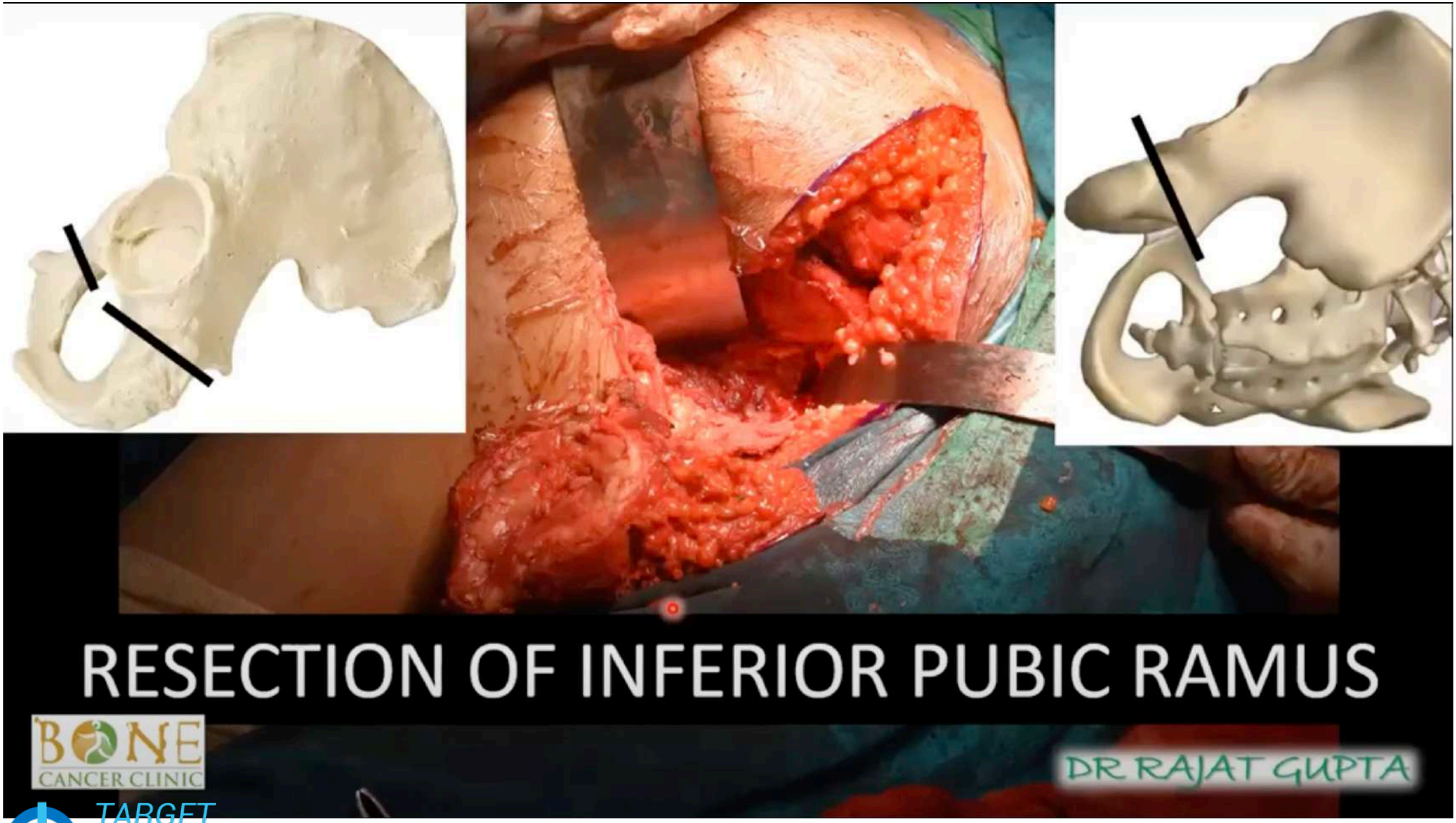
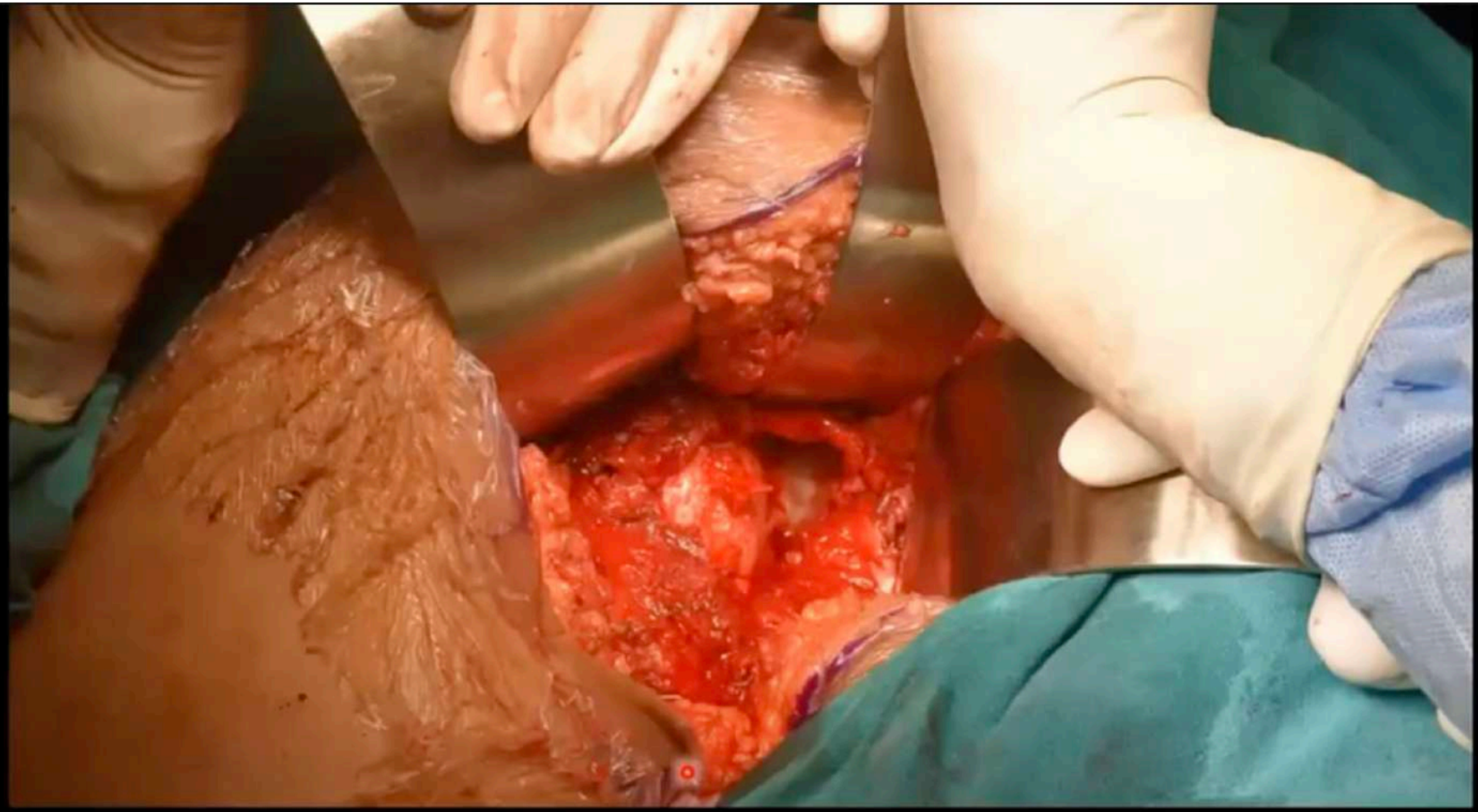




BONE CANCER CLINIC

DR RAJAT GUPTA





EXTENDED CURETTAGE OF POSTERIOR ACETABULUM & SUPRA-ACETABULAR REGION