Adverse effects of radiotherapy and chemotherapy on long term results of composite prosthesis-allograft in tumor surgery

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Introduction

In Creteil we implanted our first massive composite prosthesis allograft (MCP) in 1984

We hoped that MCP could permit a better muscle anchorage and that restoration of bone stock would decrease the loosening risk of prosthesis

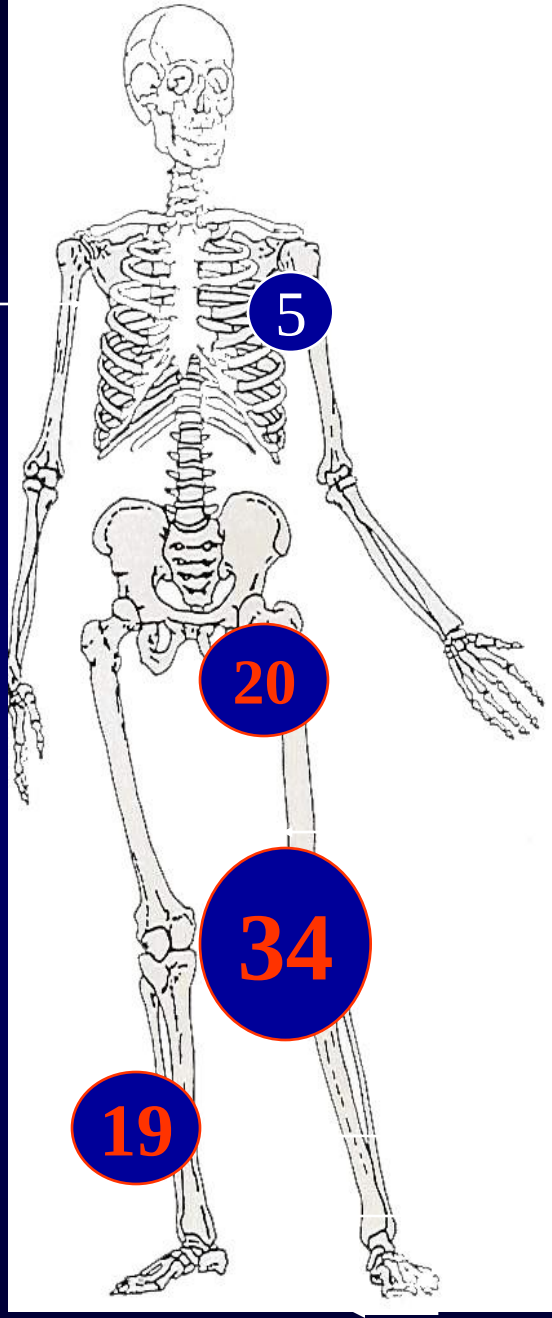
- The aims of this study is to precise the effect of adjuvant therapies on late results.

The allografts

- All allografts of this study were provided by the bone bank of Creteil :
- Sterile harvesting
- Cryopreservation by -40°
- Irradiation before implantation **25 Kgray**)
- Selection of graft on plain X rays without immunologic matching
- 3 months quarentaine before implantation

78 MCP followed up more than 12 years

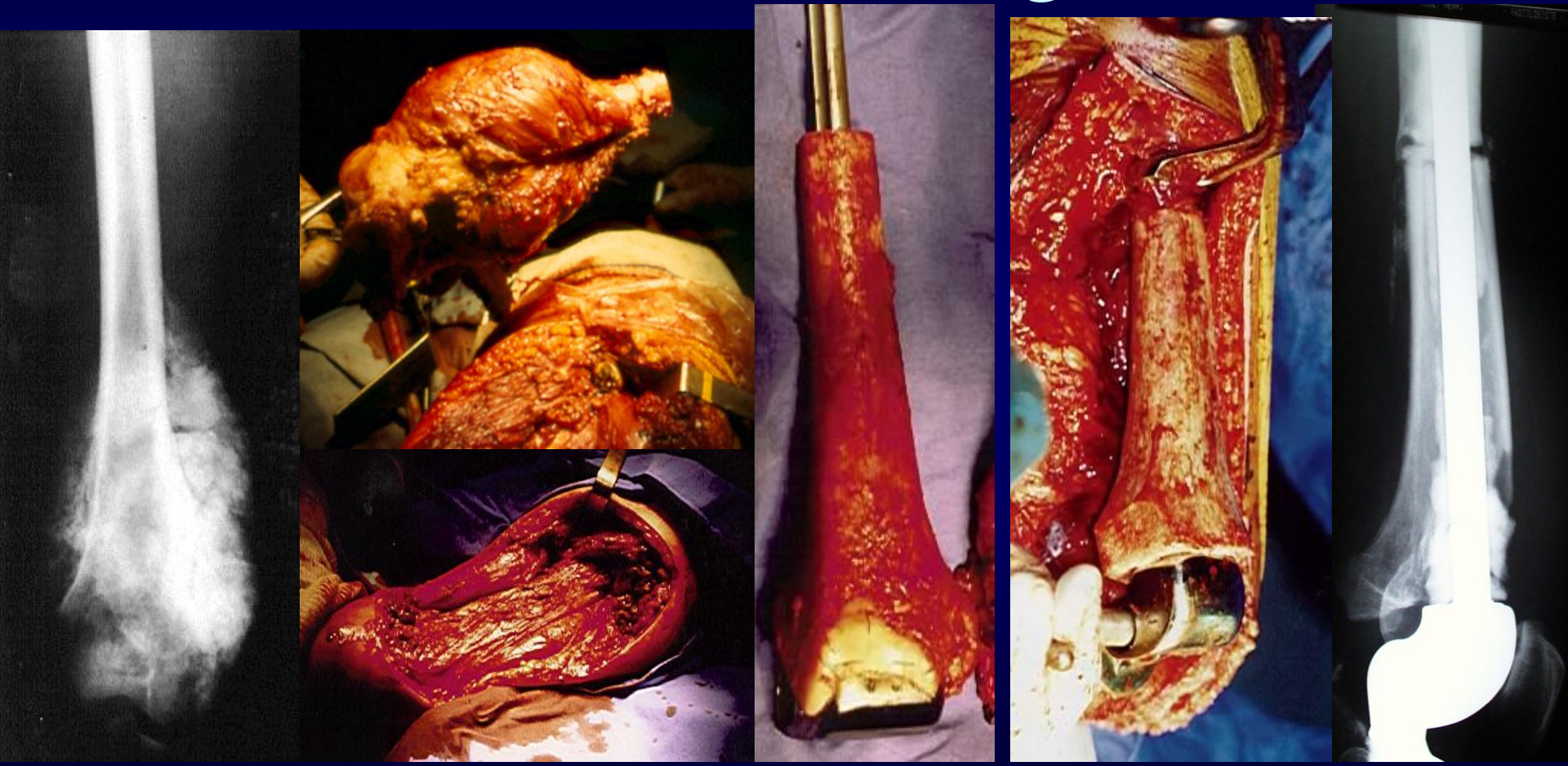
- The locations were :
- 34 Distal Femur
- 20 Proximal Femur
- Upper Tibia 19
- Proximal Humerus 5



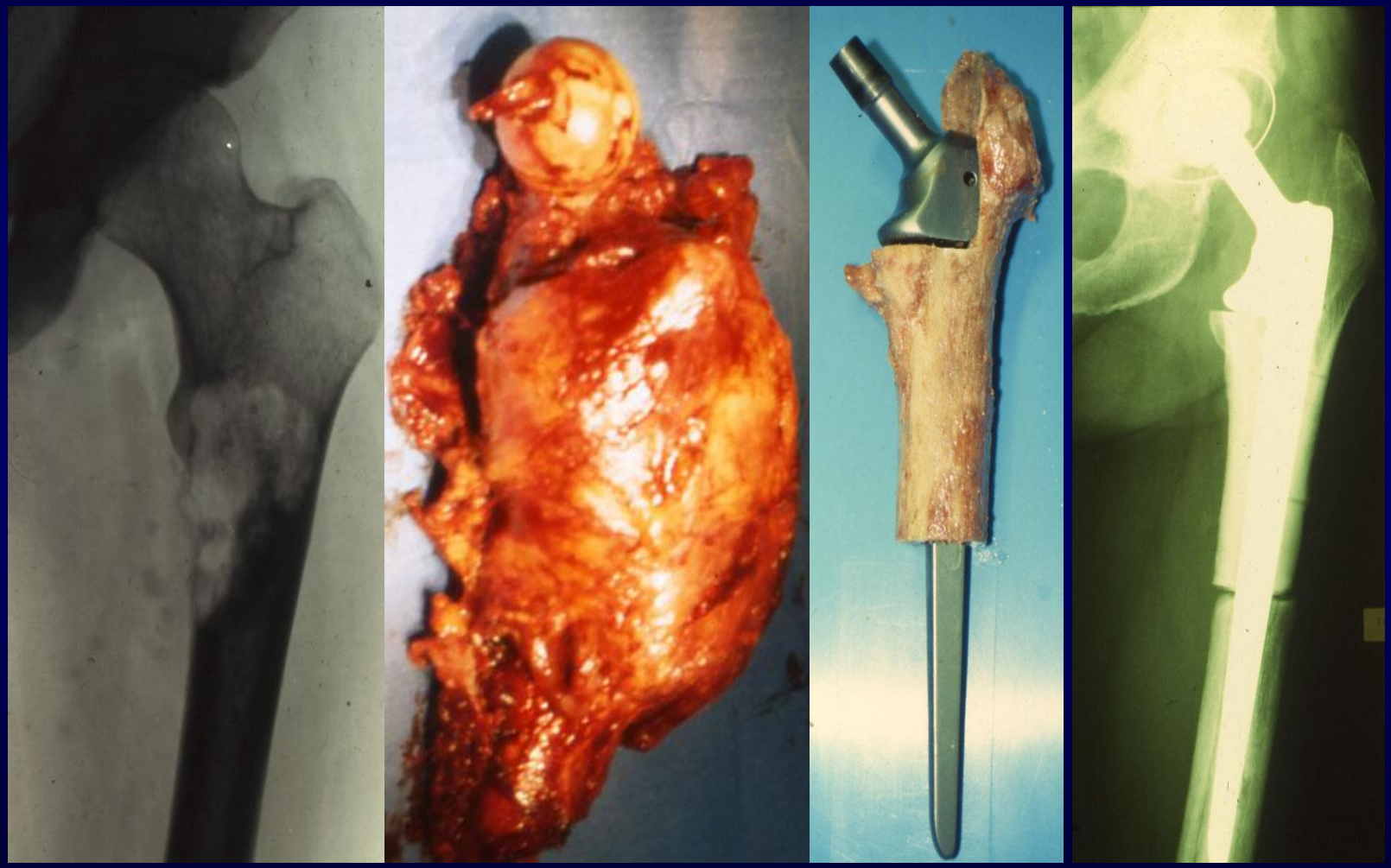
method

- Strong fixation of allograft on prosthesis (cement)
- Precise fitting of the allograft on the host bone (size selection and special tools)
- Autografting of the host-graft junction
- Good muscular coverage(flap)

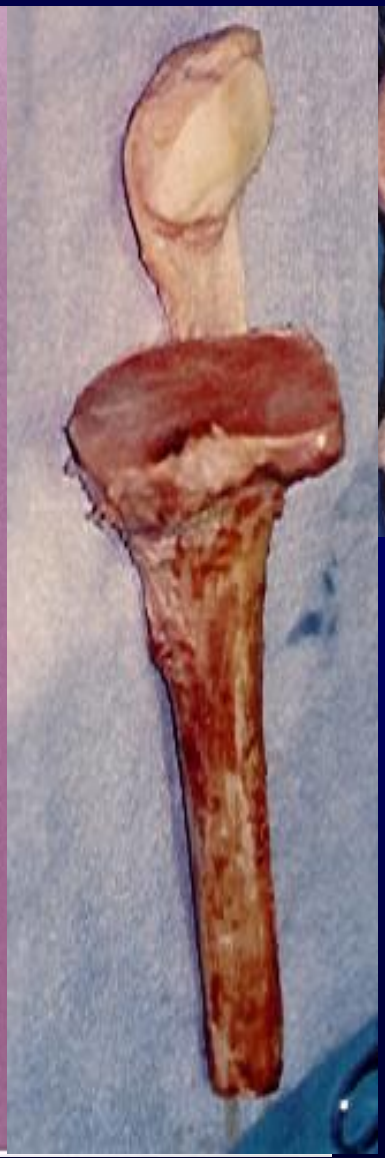
34 Skeletal Reconstructions for distal femur with long term FU

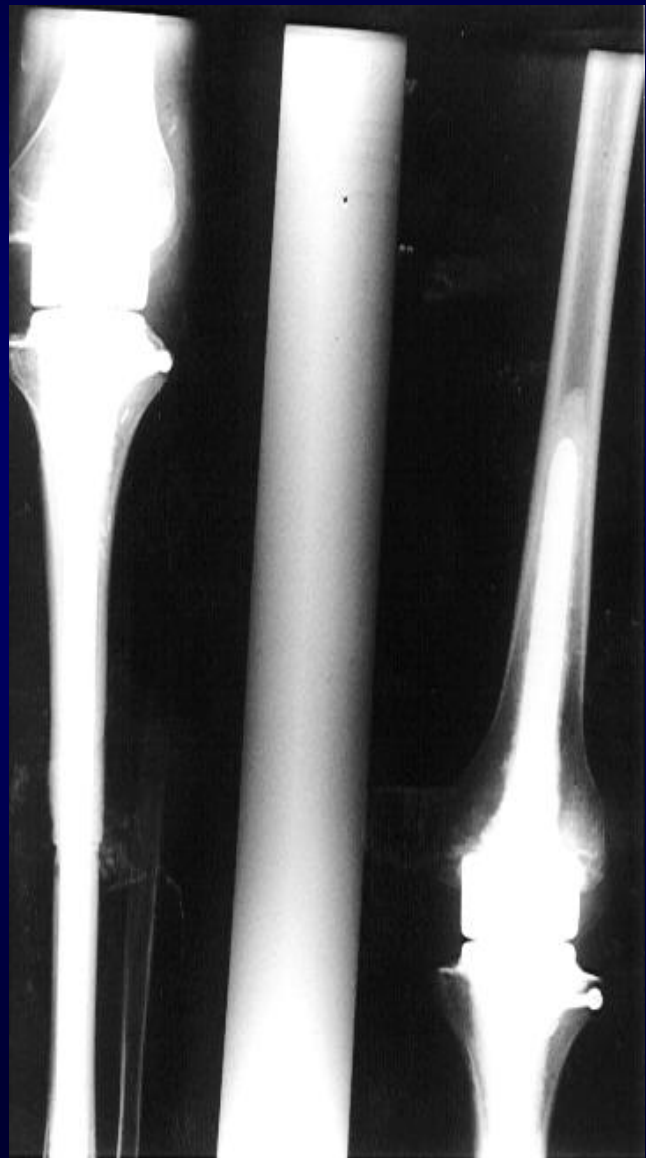


20 Skeletal Reconstructions for proximal femur with long term FU

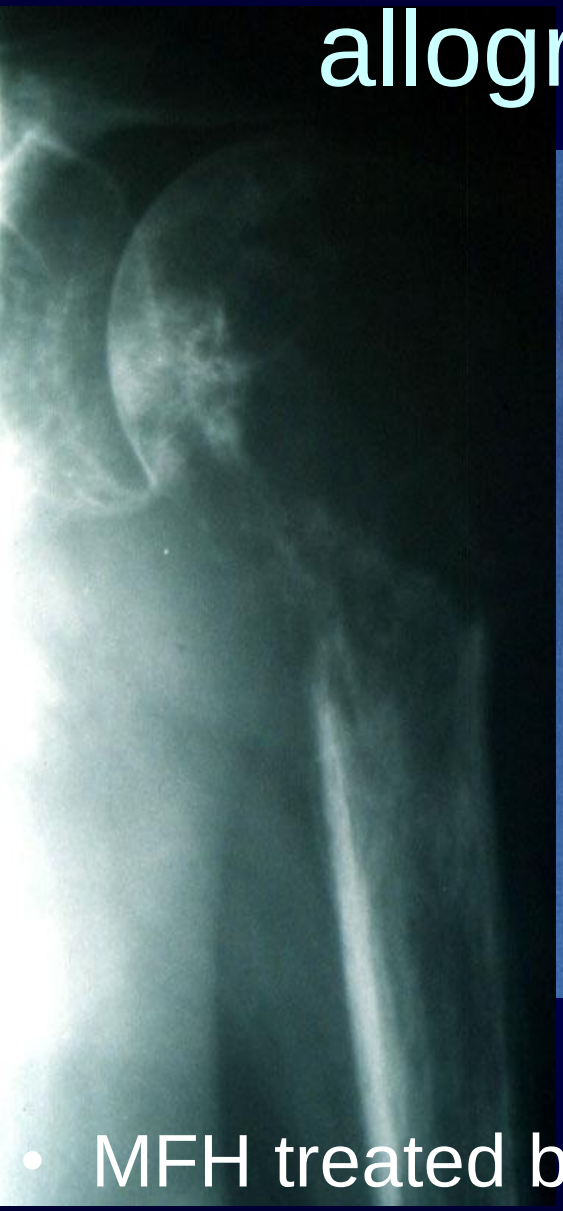


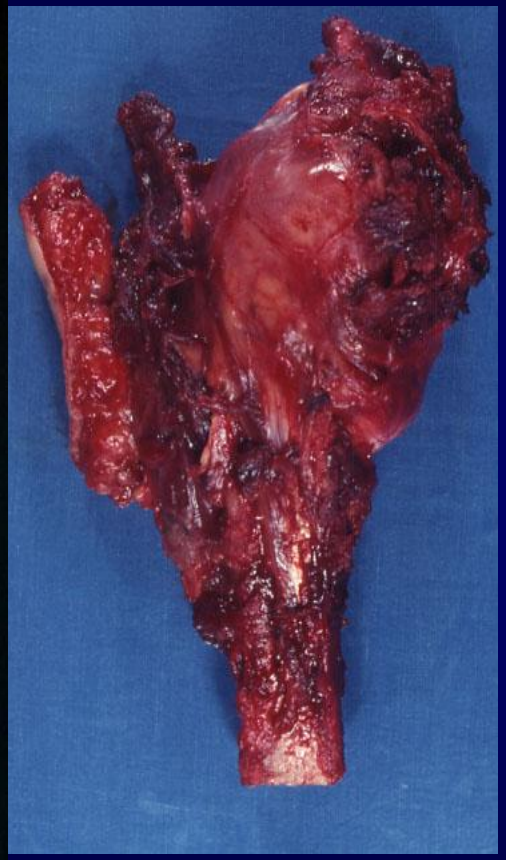
19 Skeletal reconstructions for proximal tibia with long term follow up

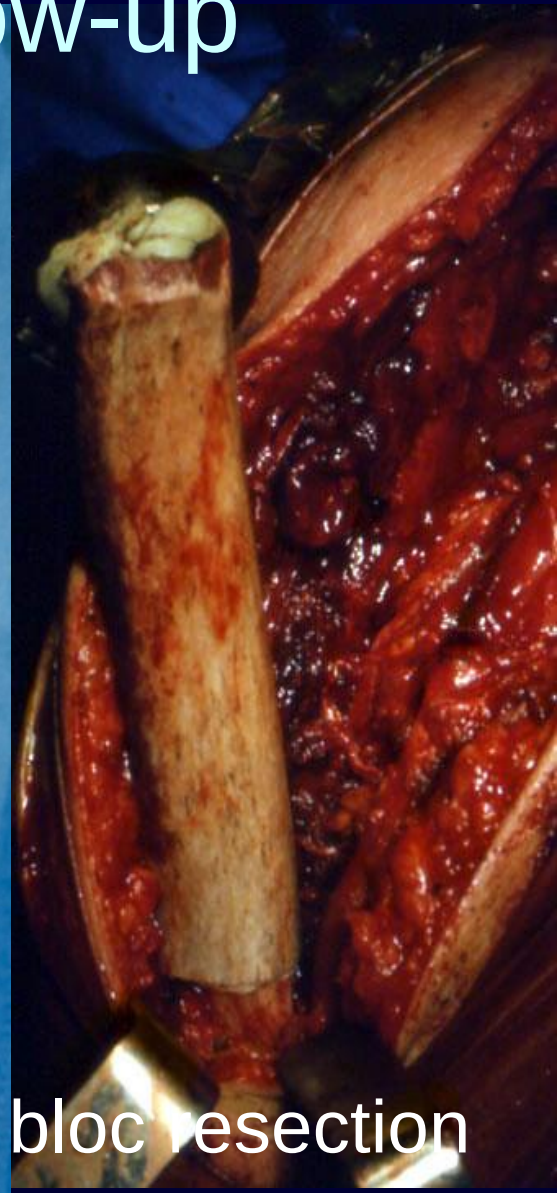




5 Reconstructions by prosthesis-allograft with long follow-up







- MFH treated by chemotherapy and en bloc resection

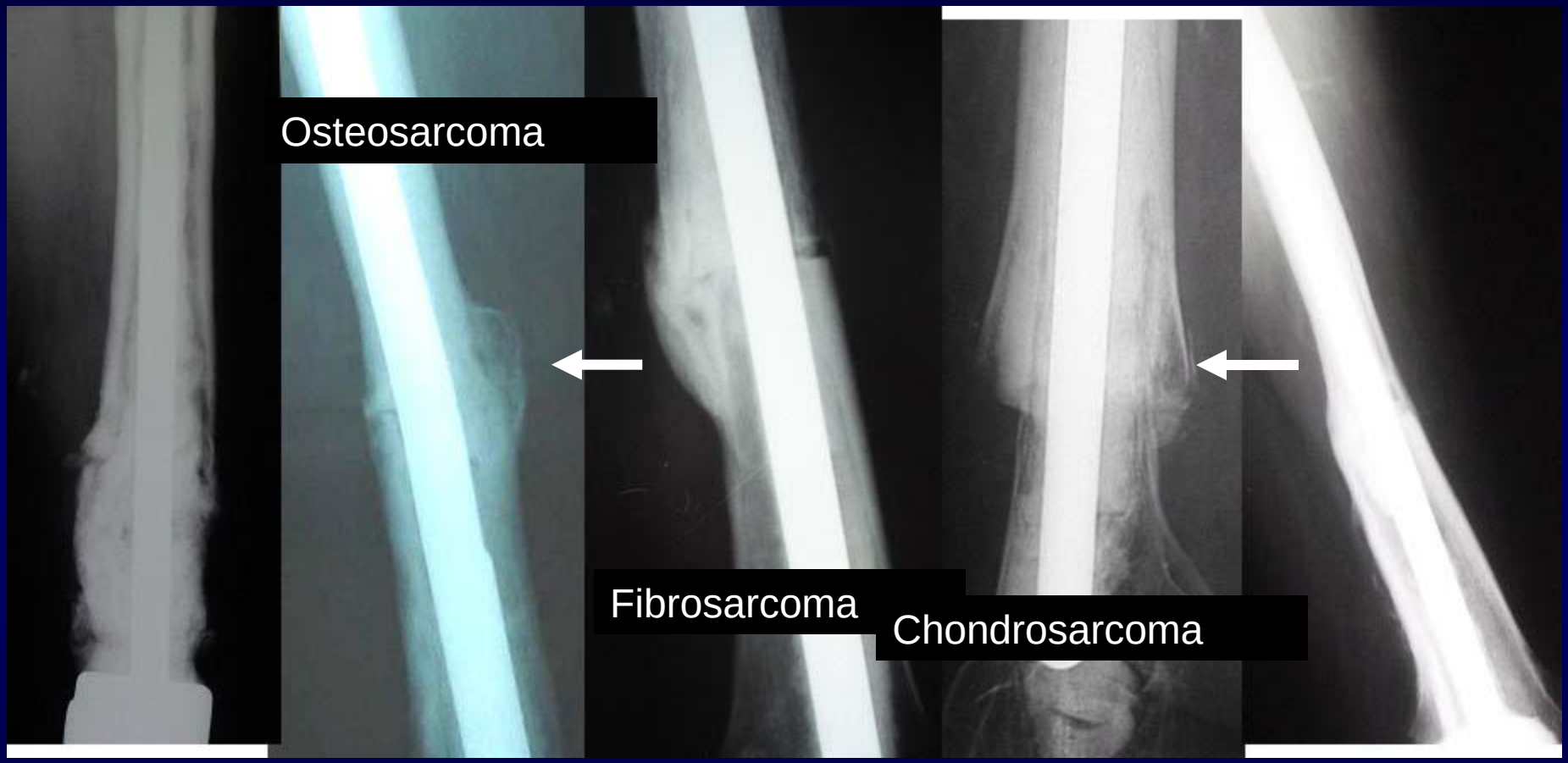
78 patients
48 males and 30 females median age 17

- The tumors were
- osteosarcoma (46)
- Ewing's (10)
- Fibrosarcoma or MFH (10)
- chondrosarcoma (7)
- Other primary 5

60 patients received chemotherapy

21 chemotherapy and radiotherapy

Bone healing is usual



Time to bone healing hangs on quality of junction and type of adjuvant treatments : chemotherapy delays the bone union

In case of association with radiotherapy the bone union is rare

NON UNION

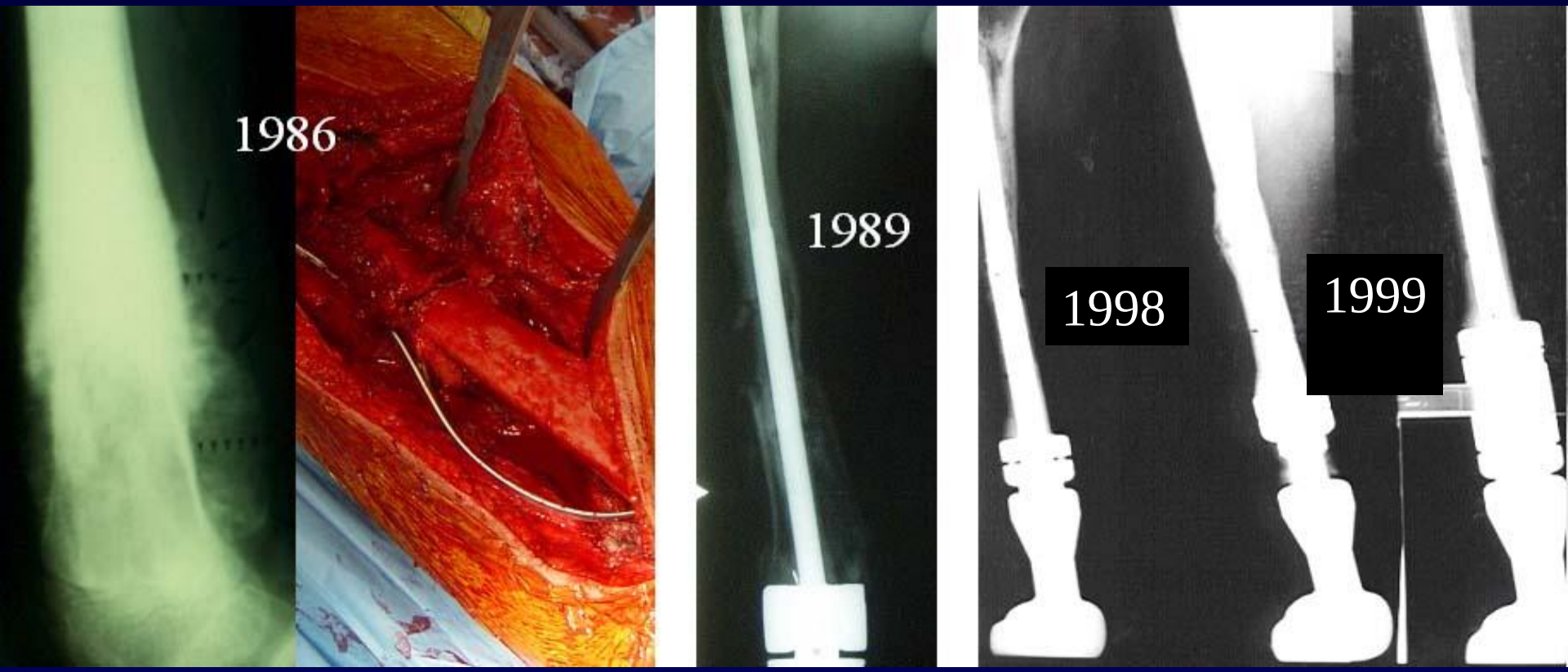
(Persistance of radiolucent line at jonction)

- 16 / 78 (20%)
- Most of them on humeral prosthesis
- Without significant auto grafting
- In patients with chemotherapy and /or radiotherapy

Long Term Results

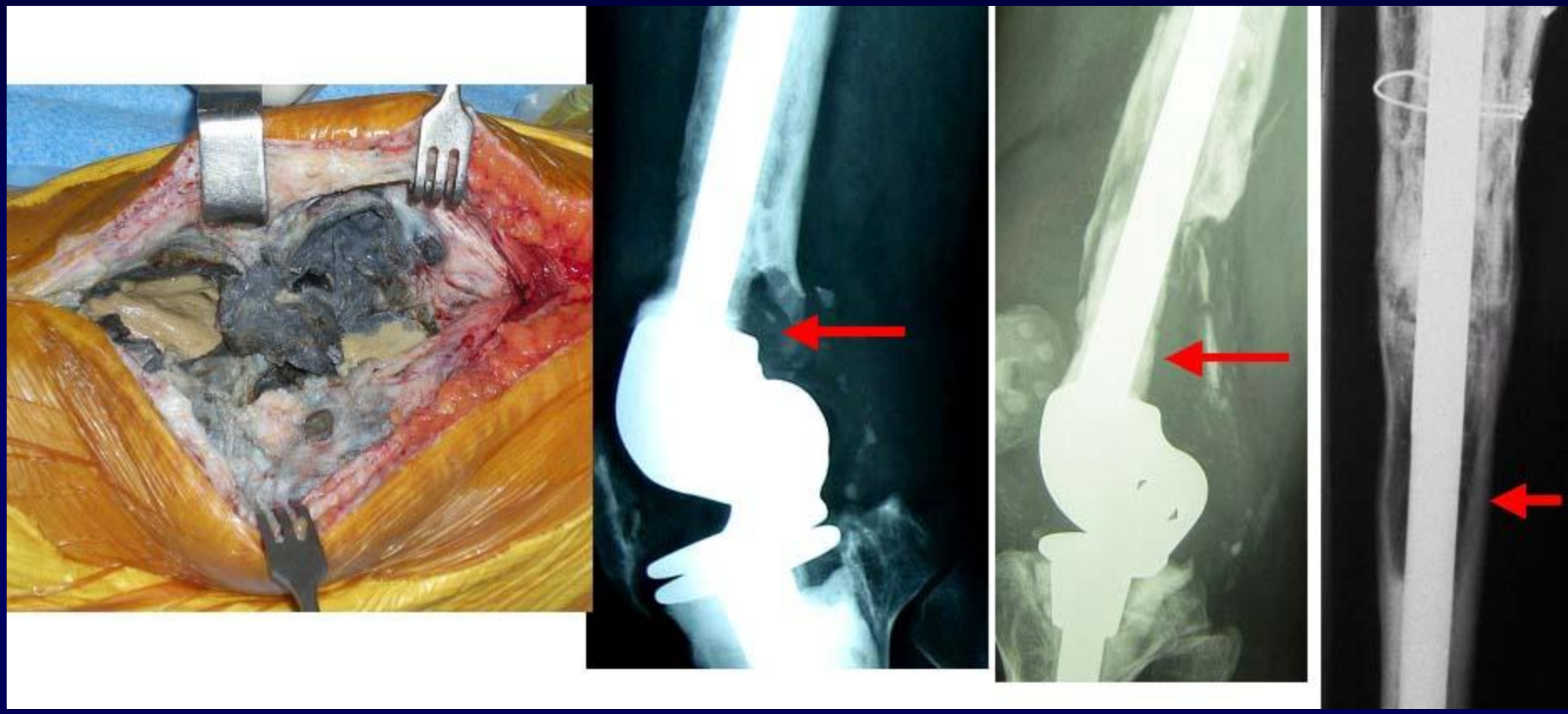
- With a median follow up of 19 years (12-24) all patients were reoperated for
- Lengthening
- Wear of prosthesis
- Loosening
- Resorption of allograft
- Infection (21) or tumour recurrence (2)

Secondary Lengthening



- The healing of the graft permits a longer anchorage for the stem of the expanding prosthesis
- Secondary lengthening 8 centimeters

Wear of prosthesis and bone resorption



- Liberation of wear particules sometimes induced a bone resorption near the articulattion or distally around the stem

Resorption of allograft in 51 patients

51 resorptions
- 25 minor
- 16 severe
- 10 major

Complications are correlated with adjuvant therapies

The 21 irradiated patients suffered of

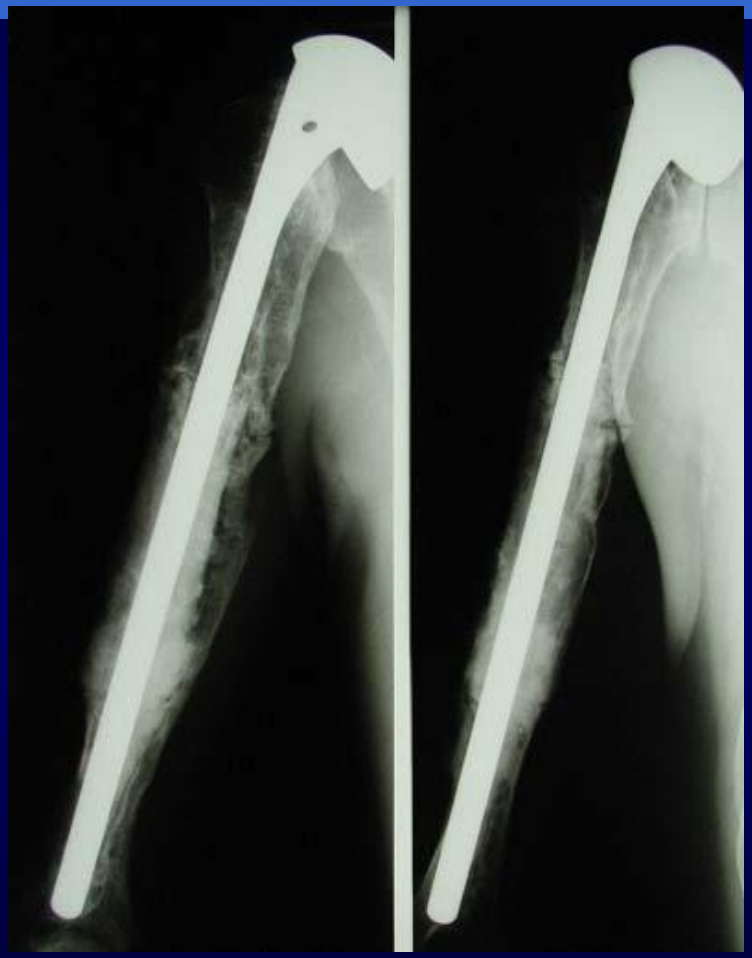
15 non union

18 secondary fractures

8 secondary major resorptions

and 11 deep infections resulting in 6 amputations

Minor RESORPTION



12 years follow up

- Chondrosarcoma. No adj.

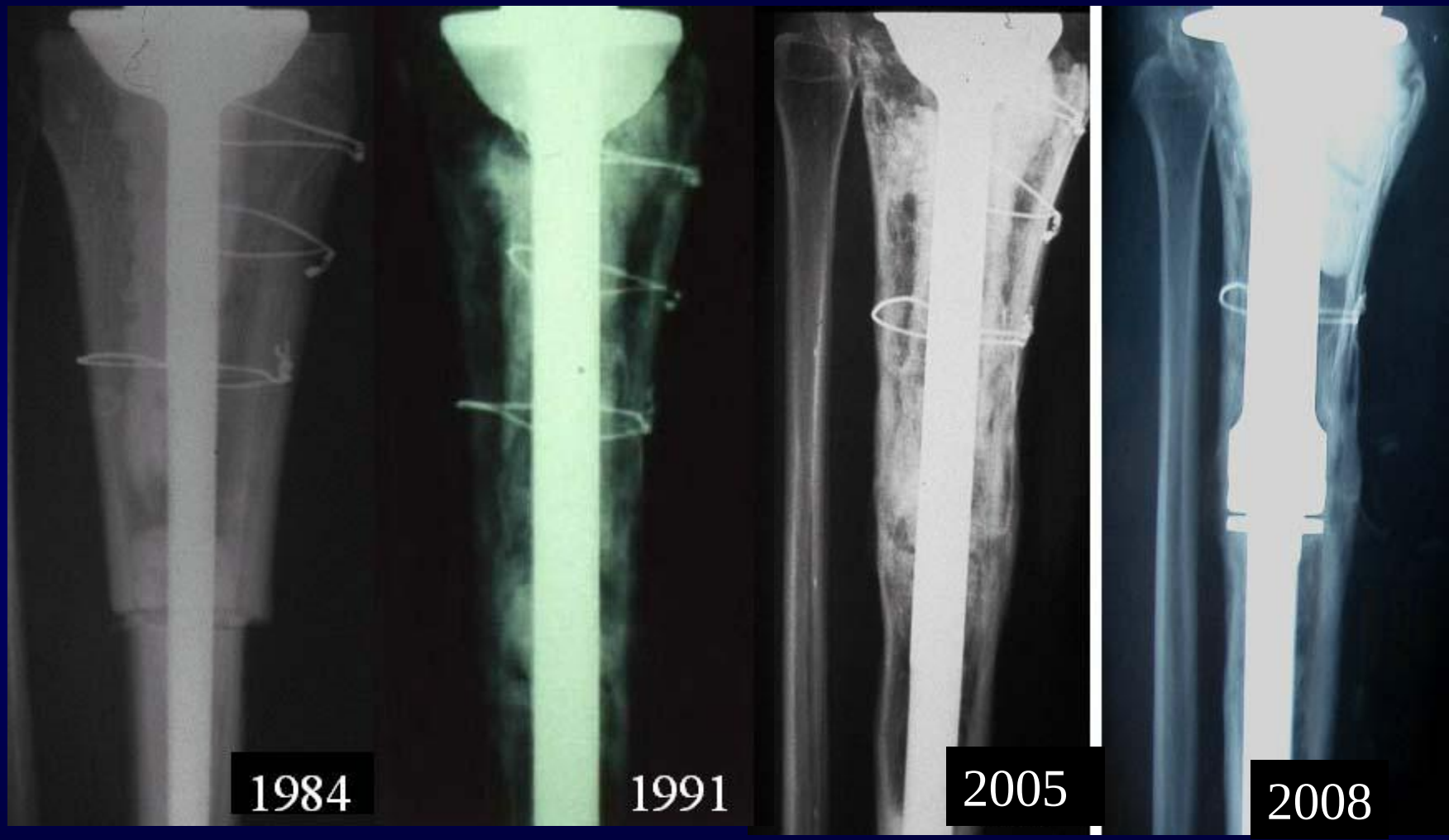
17 Years follow up

- Chondrosarcoma no adjuvant therapy.
- Wear of the acetabulum

20 years evolution

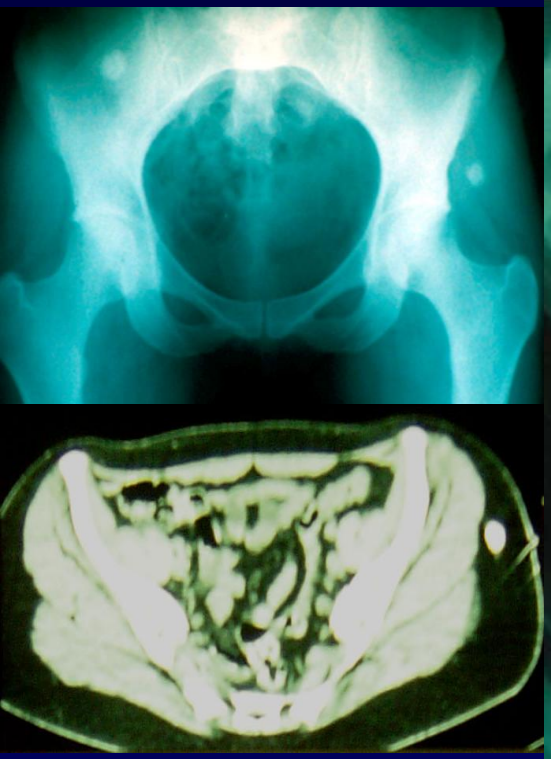
- High grade osteosarcoma
- High dose chemotherapy
- CDFS
- No radiotherapy
- Excellent graft evolution
- Excellent function

24 Y F U (no adjuvant treatment)



- No severe nor major resorption observed despite 3 exchanges of knee prosthesis

Fracture without loosening



1993

- Metastatic Juxta cortical OS. No chemotherapy.15 years FU Fracture of allograft without resorption nor loosening

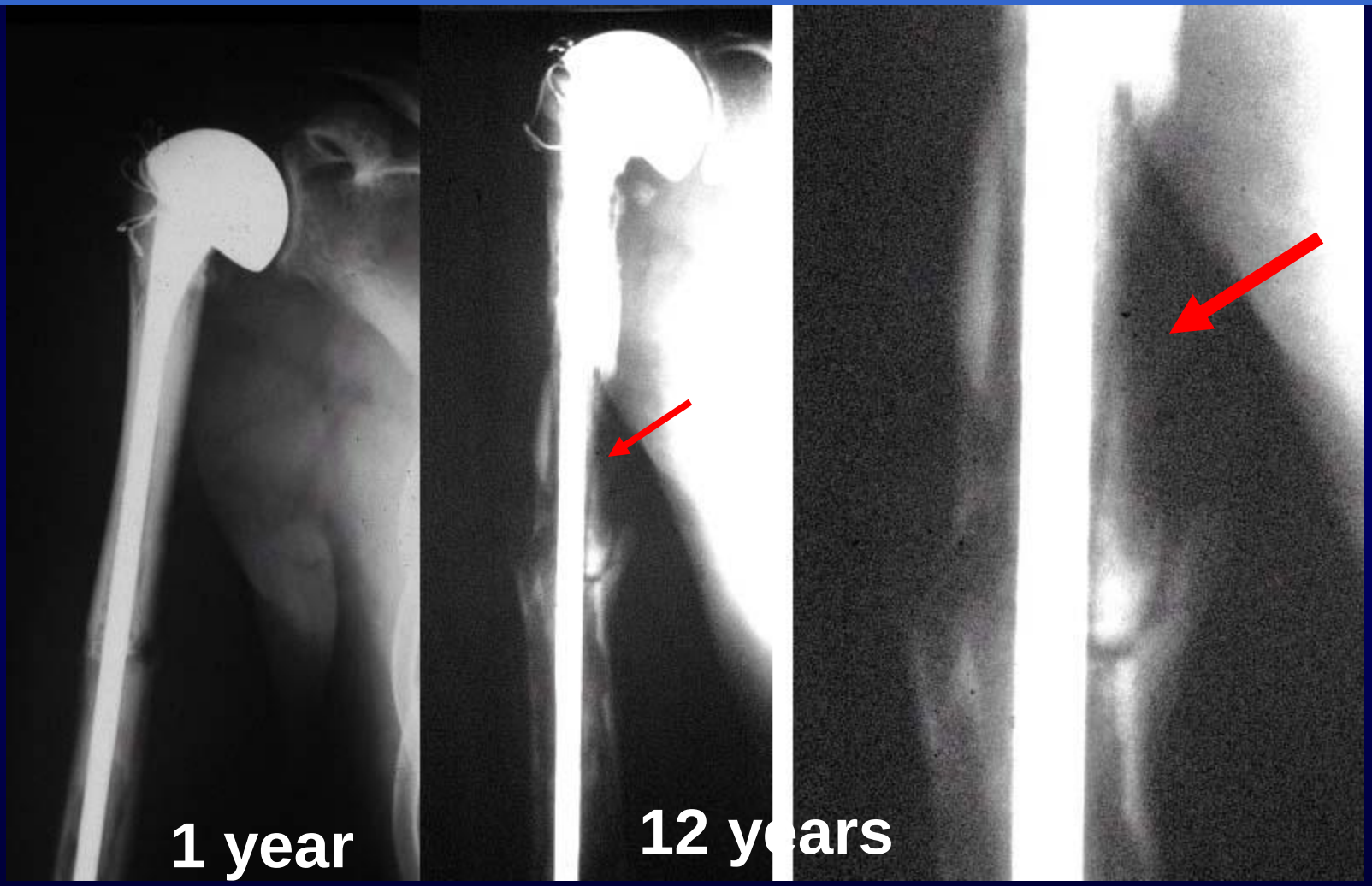
Chemotherapy, Resorption, Fracture of graft, Loosening

1993 1994 1997

- High grade OS High dose chemotherapy. Mal union and Resorption of graft induced loosening of prosthesis

RADIOTHERAPY:
non union, major resorption, fracture

MAJOR RESORPTION



Failure of MCP after radiot and CHT

OS with skip metastasis.Bad response to CHT. RTH 45 Gys.

Fracture of allograft. Loosening of prosthesis.

Total femur resection

Late results

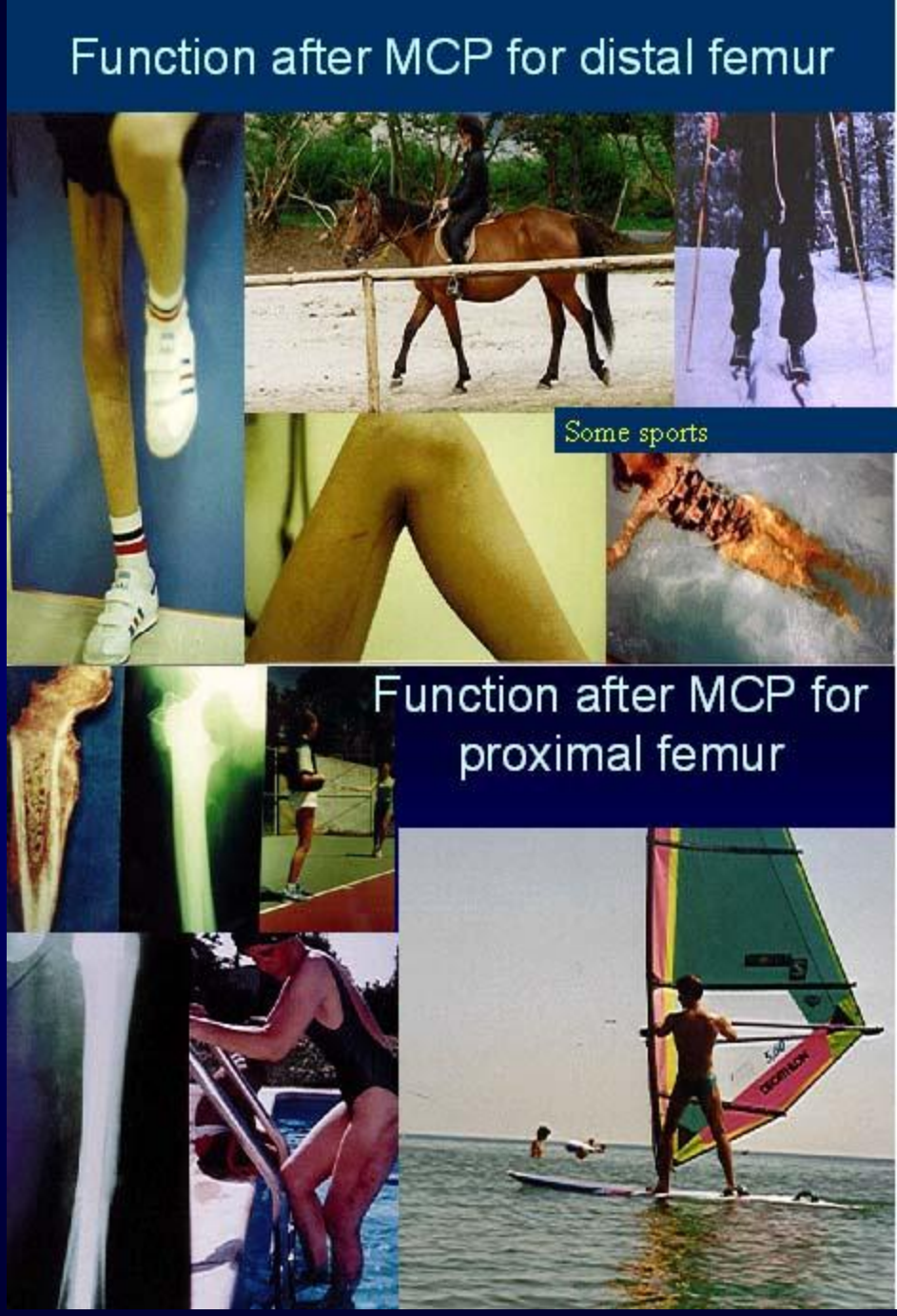
EMSOS criteria rated:

excellent in 31

good in 23

fair in 12

poor in 12



Advantages of MCP

- MCP permits a better muscle re insertion and gives usually a better function than massive prosthesis
- This advantage is more evident for upper femur and proximal tibia and humerus
- With long follow up the loosening risk of MCP does not seem different from that of massive metallic prosthesis except when a very long resection is necessary

19 years F U

- 1989 :Ewing's sarcoma with resection of 4/5 tibia
- Osteolysis of graft and wear of prosthesis but no loosening

Conclusion

- MCP are threatened by non union during chemotherapy and massive osteolysis and fracture after irradiation
- When radiotherapy can not be avoided a massive custom made prosthesis should be preferred to MCP