# Limb Salvage Using Mega prosthesis in Skeletally Immature Musculoskeletal Oncology Patients: A Retrospective Cohort Study

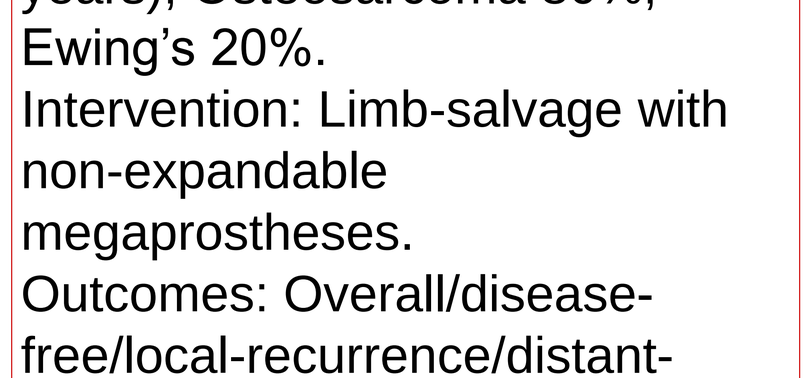
Dr Fateh Ali Janjua · Dr Zoha Farooq · Dr Khalil Khatri · Dr Ilyas Rafi
Shaukat Khanum Memorial Cancer Hospital and Research Centre, Radiation Oncology, Lahore, Pakistan.

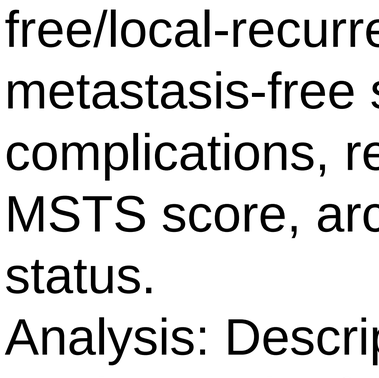
## INTRODUCTION

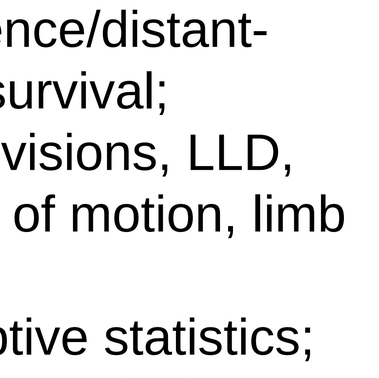
In many low- and middle-income settings, expandable endoprostheses are unaffordable, pushing children toward amputation or biologic reconstructions with major functional and psychosocial costs. We evaluated whether non-expandable (adult) modular endoprostheses can deliver acceptable function and complication rates for paediatric and adolescent limb-salvage after tumour resection.

## METHODS

Design: Retrospective cohort (2018–2024), n=71 (10–18 years); Osteosarcoma 80%, Ewing's 20%.
Intervention: Limb-salvage with non-expandable megaprostheses.
Outcomes: Overall/disease-free/local-recurrence/distant-metastasis-free survival; complications, revisions, LLD, MSTS score, arc of motion, limb status.
Analysis: Descriptive statistics; Kaplan–Meier for survival.





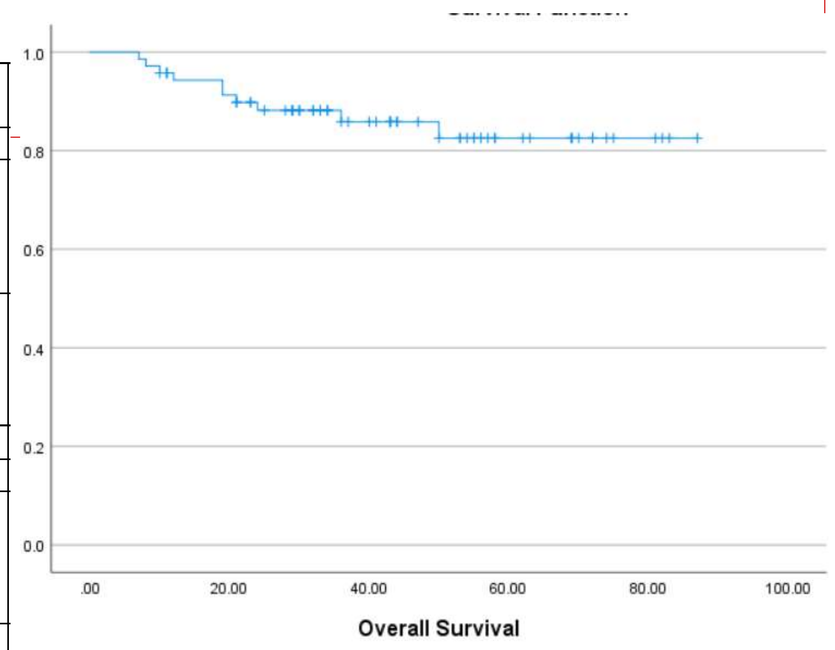


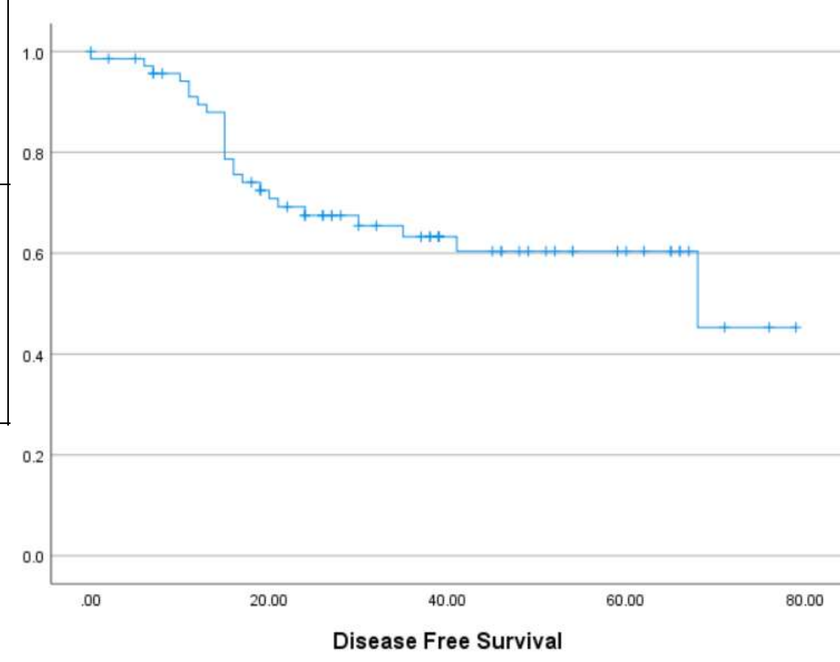

| Variable | N(%) | Osteosarcoma n(%) 57(80) | Ewings N(%) 14(20) |
|---|---|---|---|
| **Total Patients** | 71 | | |
| **Gender** | | | |
| • Male | 45(63) | 36(63) | 9(64) |
| • Female | 26(37) | 21(37) | 5(36) |
| **Side** | | | |
| • Right | 39(55) | 32(56) | 7(50) |
| • Left | 32(45) | 25(44) | 7(50) |
| **Age at surgery (10.0–18.0)** | | Mean 14.8 | Mean 15.7 |
| **Mean follow-up (months)** | | 71.6 | 81.7 |
| **Tumor bone** | | | |
| • Femur | 49(69) | 37(65) | 12(86) |
| • Tibia | 22(31) | 20(35) | 2(14) |
| **Tumor location** | | | |
| • Proximal Femur | 3(4) | 2(3) | 1(7) |
| • Shaft of Femur | 4(6) | 1(2) | 3(22) |
| • Distal Femur | 42(59) | 34(60) | 8(57) |
| • Proximal Tibia | 22(31) | 20(35) | 2(14) |
| **Type of mega prosthesis** | | | |
| • Proximal Femur Replacement | 4(6) | 3(5) | 1(7) |
| • Intercalary Femur Prosthesis | 2(3) | 0(0) | 2(15) |
| • Distal femur Replacement | 41(57) | 33(58) | 8(57) |
| • Total Femur Replacement | 2(3) | 1(2) | 1(7) |
| • Proximal Tibia Replacement | 22(31) | 20(35) | 2(14) |

| Variable | N(%) | Femur | Tibia |
|---|---|---|---|
| **Total Patients** | 71 | 49 | 22 |
| **MSTS score (post-op Mean)** | 64 | 24.59 | 23.00 |
| **Limb-length discrepancy** | 63 | 1.60 | 1.47 |
| **LLD General** | 63 | 45 | 18 |
| • Shortening | 23(36) | 16(36) | 7(39) |
| • Equal | 20(32) | 18(40) | 2(11) |
| • Lengthening | 20((32) | 11(24) | 9(50) |
| **Mean Arc of motion** | 64 | 103 | 93 |

| Variable | N(%) | Femur | Tibia |
|---|---|---|---|
| **Complications** | 39 | 17 | 22 |
| • Deep Infection | 6(15) | 2(12) | 4(19) |
| • Flap Failure | 1(2) | 0(0) | 1(4) |
| • Skin Necrosis | 6(15) | 2(12) | 4(19) |
| • Implant Failure | 2(5) | 2(12) | 0(0) |
| • Wound Dehiscence | 7(18) | 4(23) | 3(14) |
| • DVT | 1(2) | 0(0) | 1(4) |
| • Hematoma | 1(2) | 0(0) | 1(4) |
| • Superficial infection | 3(8) | 2(12) | 1(4) |
| • Knee Effusion | 2(5) | 0(0) | 2(9) |
| • Neurological Injury | 10(25) | 5(29) | 5(23) |
| **Types of Implant Failure** | 26(37) | 14(54) | 12(46) |
| • Type 1 Soft-tissue failure | 12(46) | 5(36) | 7(58) |
| • Type 2 Aseptic loosening | 0(0) | 0(0) | 0(0) |
| • Type 3 Structural failure | 2(8) | 2(14) | 0(0) |
| • Type 4 Infection | 6(23) | 2(14) | 4(33) |
| • Type 5 Tumor progression | 6(23) | 5(36) | 1(9) |
| **Number of revisions** | 7 | 4 | 3 |
| • 1 | 6 | 3 | 3 |
| • 2 | 1 | 1 | 0 |
| **Reason for Revision** | | | |
| • Infection | 6 | 2 | 4 |
| • Periprosthetic fracture | 1 | 1 | 0 |
| • Acetabular Erosion | 1 | 1 | 0 |

| Variable | N(%) 71 | Osteosarcoma n(%) 57(80) | Ewings N(%) 14(20) |
|---|---|---|---|
| **Distant Metastasis** | | | |
| • Yes | 21 | 17(30) | 4(29) |
| • No | 50 | 40(70) | 10(71) |
| **Location of Metastasis** | 21 | | |
| • Lungs Only | 16(75) | 13(76) | 3(75) |
| • Lung + Hepatic | 2(10) | 2(12) | 0 |
| • Lung +Bone | 2(10) | 2(12) | 0 |
| • Spine Only | 1(5) | 0(0) | 1(25) |
| **Local Recurrence** | | | |
| • Yes | 8 | 7 | 1 |
| • No | 63 | 50 | 13 |
| **Margins** | | | |
| • Negative | 65 | 53 | 12 |
| • Positive | 6 | 4 | 2 |
| **Limb Reconstruction Outcome** | | | |
| • Salvaged | 64 | 52(91) | 12(86) |
| • Amputation | 7 | 5(9) | 2(14) |
| **Cause of Amputation** | | | |
| • Infection | 2 | 1 | 1 |
| • Recurrence | 5 | 4 | 1 |
| **Survival Status** | | | |
| • Alive | 57 | 45 | 12 |
| • Deceased | 10 | 9 | 1 |
| • Lost to Follow up | 4 | 3 | 1 |
| **Overall Survival (Mean)** | 76 | 71 | 81 |
| **Disease Free Survival (Mean)** | 53 | 51 | 56 |
| **Local Recurrence Free Survival (Mean)** | 71 | 67 | 74 |
| **Distal Metastasis Free Survival (Mean)** | 57 | 55 | 60 |




## RESULTS

Survival: OS 85.9%, DFS 64.8%, LRFS 75.8%, DMFS 70.4%.
Complications: 39 patients; neurological injury (n=10), deep infection (n=6), wound dehiscence (n=7), skin necrosis (n=6).
Revisions: 7 patients (9.9%).
LLD: Most commonly 2–4 cm (68%).
Limb status: 90.1% reconstruction retained, 9.9% amputation.
Function: Mean MSTS ≈ 24; mean ROM ≈ 100° .

## CONCLUSION

Non-expandable adult modular endoprostheses are a viable, cost-conscious limb-salvage option for carefully selected skeletally immature patients in resource-limited settings. In our cohort, early function and implant survivorship were acceptable, limb-length discrepancy was manageable in majority of our patients, and complications were within expected ranges—supporting broader use where growing implants are impractical.

## REFERENCES

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SHAUKAT KHANUM MEMORIAL
CANCER HOSPITAL & RESEARCH CENTRE
7-A Block R III, Johar Town, Lahore, Pakistan
www.shaukatkhanum.org.pk