

3D-PRINTED CUTTING GUIDES FOR INTERCALARY LONG BONE RESECTION AND ALLOGRAFT RECONSTRUCTION IN EXTREMITY BONE SARCOMA

M Gasparro, BS¹, C Gusho, BS¹, O Obioha, MD¹, M Batus MD¹, M Colman, MD¹, S Gitelis, MD¹, A Blank, MD, MS¹

¹RUSH UNIVERSITY MEDICAL CENTER

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INTRODUCTION

Patient-specific 3D-printed cutting guides for the resection of long bone tumors and allograft reconstruction is a novel technique.

Prior to cutting guides, resection of long bone tumors was more difficult and resulted in less precise cuts with variable patient outcomes.^{1,2}

This study aimed to validate the use of these 3D-printed cutting guides in the resection of long bone malignancies.

METHODS

A retrospective review of 6 patients was performed.

Patients were included if a 3D-printed cutting guide and intercalary allograft reconstruction were utilized during their long bone sarcoma surgery.

Margin status, union/nonunion, complications, and disease-related outcomes were recorded.

| Case | Age/Sex | Diagnosis | Location |
|------|---------|----------------|----------|
| 1 | 32 F | Osteosarcoma | Tibia |
| 2 | 18 M | Ewing Sarcoma | Tibia |
| 3 | 60 F | Ewing Sarcoma | Femur |
| 4 | 21 M | Osteosarcoma | Tibia |
| 5 | 35 F | Chondrosarcoma | Femur |
| 6 | 19 M | Ewing Sarcoma | Femur |

Table 1. Patient demographics and tumor characteristics.

METHODS (continued)

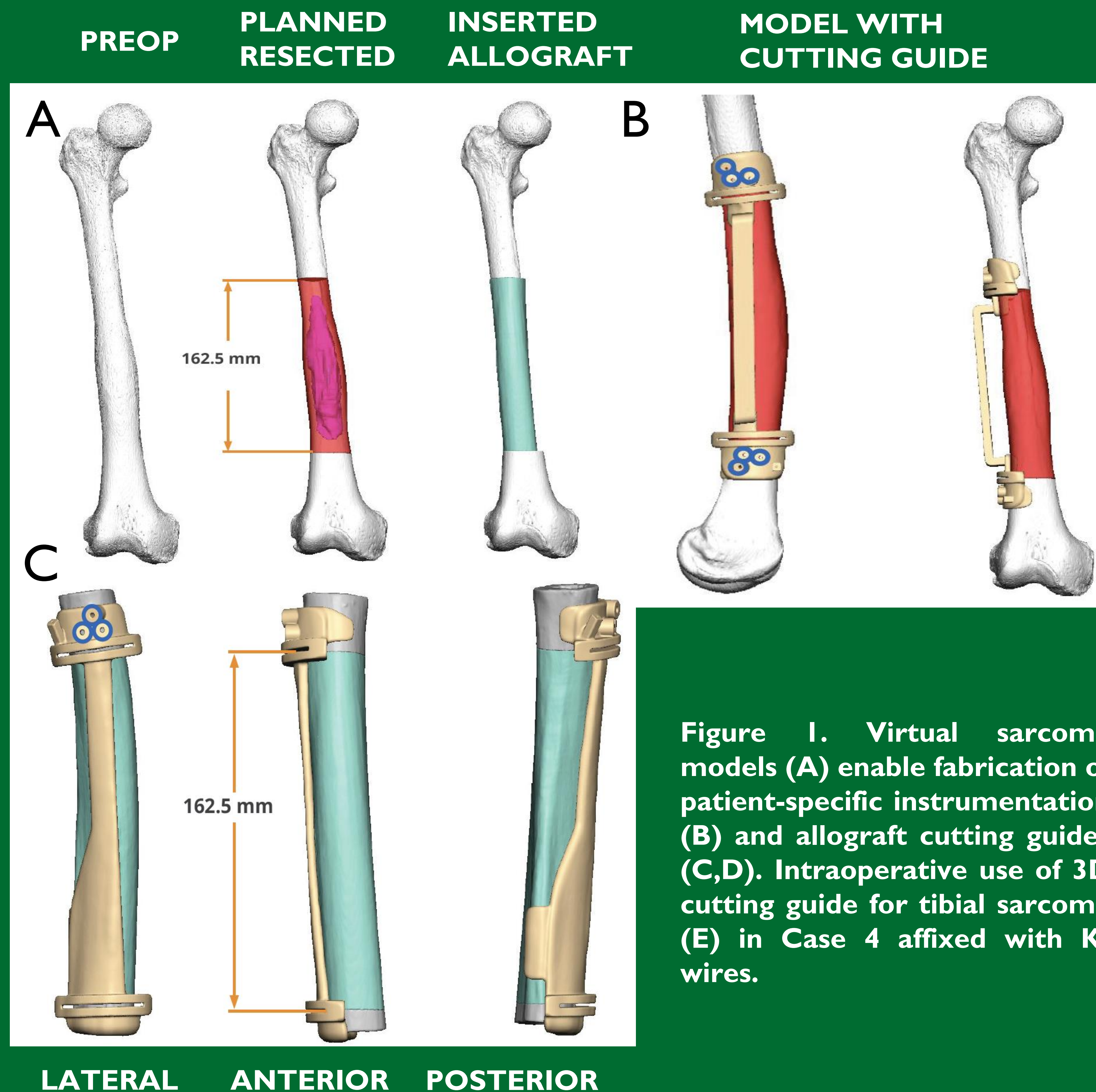


Figure 1. Virtual sarcoma models (A) enable fabrication of patient-specific instrumentation (B) and allograft cutting guides (C,D). Intraoperative use of 3D cutting guide for tibial sarcoma (E) affixed with K-wires.

RESULTS

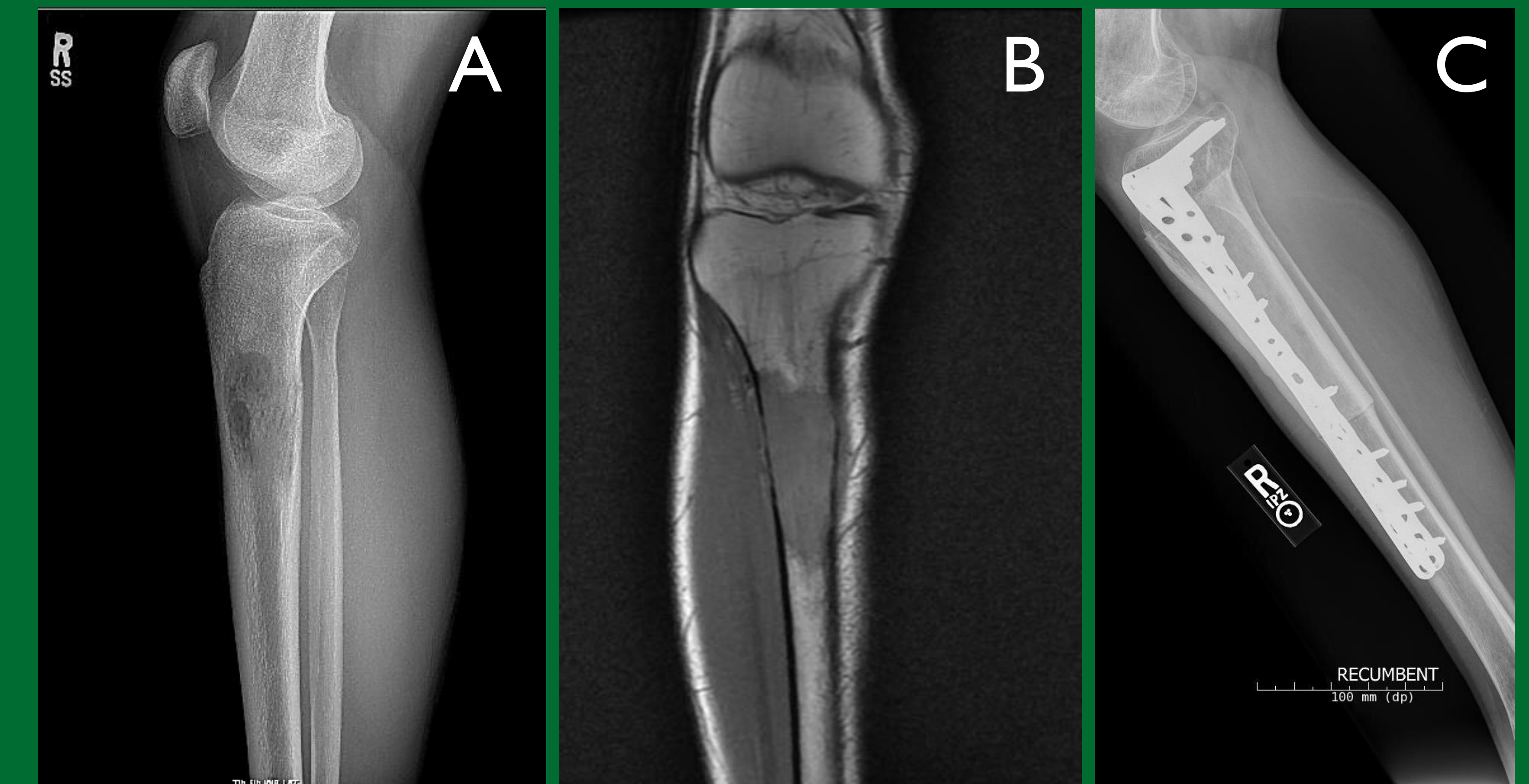


Figure 2. Case 4: Preoperative radiograph (A) and MRI (B) and postoperative lateral radiograph (C) showing bridging plate osteosynthesis going on to union.

- Nine of 12 (75%) cumulative osteotomy sites went on to union.
- 2 non-unions (66.7%) received adjuvant radiation therapy.
- 2 (33.3%) reconstructions failed (Henderson Type 3; implant failure).
- 0 local recurrences at maximum recorded follow-up of 4.05 years.
- 0 perioperative infections recorded.

SUMMARY

Our institution has successfully performed limb salvage surgery with patient-specific 3D-printed technology.

We demonstrate high rates of negative margin resection, low rates of infections, and acceptable rates of junctional union that align with historical and more recent series.^{3,4}

REFERENCES

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