A challenging case of limb salvage requiring a combination of composite fixation and Masquelet technique to overcome significant segmental bone loss
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INTRODUCTION
Both the Masquelet technique and composite fixation have each been used individually with success in the treatment of segmental bone loss. We present a unique case in which a combination of these two techniques was required in order to recreate a large section of segmental bone loss in an open femur fracture. A 19-year-old male college student incurred an open fracture of the femur involving significant segmental bone loss, and presented to our institution for limb salvage surgery. This patient had undergone serial debridements for the open fracture, and first presented to us in an external fixator. The magnitude of his segmental femoral bone loss included the distal 10cm of the bony diaphysis, to the level of supracondylar femoral flare.

PROCEDURE
The Masquelet technique is a two-stage procedure used to induce growth of a pseudomembrane at the site of segmental bone loss, into which graft is then later placed. First pioneered by the French surgeon whose name the practice bears, an antibiotic cement spacer is placed in an area of bony defect to induce pseudomembrane formation over the course of weeks, then later filled with graft material which eliminates the defect.1

Composite fixation involves adjunctive endosteal stabilization in addition to standard lateral plating and bone grafting.2,3 The superior strength achieved through composite fixation provides stability greater than that of any single method, giving graft material time to incorporate.

Overcoming the magnitude of the segmental femur defect in our patient would require a combination of both techniques; the Masquelet technique to fill the bony void, and the superior support of composite fixation to achieve an enduring, stable construct to allow adequate osseous integration.

RESULTS
Six weeks after placement of an antibiotic cement spacer and initial lateral locking plate fixation, our young adult patient was returned to the operating room for the second stage of his procedure. A robust pseudomembrane was encountered upon spacer removal, into which a titanium cage was implanted in the composite phase of the procedure. Aspirated autograft bone was combined with cancellous allograft, and used to fill the bony defect by placing it around the titanium cage, within the pseudomembrane sleeve.

By eight months post-procedure, remarkable incorporation of the graft material with bony ingrowth of the patient’s segmental defect is evident on X-ray. Successful reconstruction of the bony void in this devastating injury is a seminal accomplishment in a long journey toward successful limb salvage.

DISCUSSION
Surgical techniques in the dynamic world of adult reconstructive surgery continue to evolve. Although a single technique to address all aspects of cases of complex reconstruction remains elusive, creative combinations of these techniques hold great promise. The Masquelet technique has been successfully employed to overcome segmental defects up to 25cm in length.4,5 Composite fixation has been advanced as a means of endosteal stabilization, overcoming recalcitrant nonunion in cases where large defects confound efforts at adequate stabilization.2

By combining two proven surgical modalities, we have successfully eliminated a large segmental defect, granting a patient a genuine chance to keep his leg that might not have been possible even a decade earlier.

References