Title: **Chest of Steel: Multimodal Reconstruction in Salvaging the Chest Wall for an Advanced Recurrent Papillary Thyroid Carcinoma**

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ABSTRACT

Introduction

Papillary thyroid carcinoma (PTC) is typically slow-growing and treatable, but in rare cases, it can behave aggressively, invading surrounding structures and metastasizing to distant sites. Chest wall involvement by recurrent PTC is exceptionally rare, with only a few cases documented globally. This report presents a unique case of advanced recurrent PTC with extensive anterior thoracic invasion, managed through radical resection and a thoughtfully engineered multimodal reconstruction. The approach not only achieved oncologic control but also preserved upper limb function—an outcome that challenges conventional reconstructive norms.

Methods

A 57-year-old male with a history of PTC presented with massive bilateral cervical masses and a manubrial tumor extending into the clavicles and upper ribs. Imaging revealed widespread bony destruction and soft tissue infiltration, along with pulmonary and adrenal metastases. A multidisciplinary team performed a staged procedure that included bilateral neck dissection, tracheostomy, and radical resection of the manubrium, medial clavicles, and anterior ribs. Reconstruction involved titanium plates for skeletal stability, a Dacron graft to bridge the clavicular gap, and Prolene mesh to reinforce the mediastinal defect. Bilateral pectoralis major muscle flaps and split-thickness skin grafts provided soft tissue coverage. Postoperative care focused on respiratory support, endocrine stabilization, and rehabilitation.

Results

Despite the extent of resection, the reconstruction successfully restored thoracic integrity and preserved scapulothoracic motion. Histopathology confirmed recurrent PTC with extranodal extension across multiple lymph node groups, but all margins were clear. The patient developed a thyroid storm postoperatively, requiring prolonged ventilatory support and intensive care. Nevertheless, he achieved full motor recovery, stable chest wall mechanics, and excellent graft viability. At six months, he was ambulatory, breathing comfortably on room air, and showed no signs of wound complications. Surveillance imaging and surgical planning for adrenalectomy are currently underway.

Conclusion

This case stands out for its rare oncologic presentation and the innovative reconstructive strategy employed. Traditional titanium-only constructs, while structurally sound, often lack clavicular anchorage, sometimes leading to shoulder droop and impaired upper limb function. By integrating a Dacron graft to bridge the clavicular remnants, the team preserved shoulder contour and dynamic movement—an outcome rarely achieved in

similar resections. The hybrid construct offered both rigidity and flexibility, allowing for biomechanical continuity across the thoracic inlet. This approach not only salvaged the chest wall but also maintained functional integrity, demonstrating how tailored reconstruction can elevate outcomes in complex thoracic oncology. The case adds valuable insight to the limited global literature and reinforces the power of multidisciplinary innovation in surgical care.