

EP14.20: EVOLUTION OF CHEST WALL RECONSTRUCTION FOR MALIGNANCY IN A RESOURCE-LIMITED SETTING

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INTRODUCTION

- Reconstruction is not optional.** The chest wall must be rebuilt to restore skeletal integrity, preserve pulmonary mechanics, protect intrathoracic structures, and maintain contour.
- The technology is unevenly distributed.** Titanium systems, rigid rib fixation and patient-specific PEEK implants are standard in high-income centers. Cost, infrastructure and training limit access elsewhere.
- No head-to-head institutional data.** Techniques used in low- and middle-income settings have been reported individually, but never compared within one institution.

FOUR PHASES AT PGH

- 1 ADAPTIVE** (Pre-2024)
Improvised mesh and local flaps. No rigid fixation system available
- 2 STRUCTURED** (2015-2022)
Marlex mesh, then the methylmethacrylate birdcage.
- 3 PRECISION** (2023-2024)
CT-derived 3D-printed negative molds. Titanium plating adopted in parallel.
- 4 BIOLOGICAL** (2025)
First patient-specific 3D-printed PEEK neorib at our institution.

OBJECTIVE

To describe the experience and surgical outcomes of patients with malignancy who underwent chest wall reconstruction using four different techniques at a Philippine tertiary government referral center.

METHODS

Table 1. Study design

Design	Single-center retrospective cohort.
Setting	Philippine General Hospital, national university referral center.
Period	January 2022 – July 2025.
Included	Adults ≥19 y with primary, recurrent, metastatic or directly invading neoplasms requiring chest wall reconstruction.
Excluded	Mesh- or patch-only repair; defects <5 cm; trauma or infection as primary indication.
Analysis	Descriptive statistics, IBM SPSS v25; approved by the UPM Research Ethics Board.

RESULTS

Patient & Disease Profile

Seventeen eligible patient records were reviewed. The median age was **53 years** (IQR 48–57), with the majority **aged 40–65**; one patient was younger than 40 and none was older than 65. Most were **female** (n = 15), and comorbidities were uncommon — 12 patients (70.6%) had no significant medical condition.



Figure 1. Median Defect Area By Technique (cm²)

Reconstructive burden was comparable across groups, with all facing defects ≥100 cm² and the largest in the birdcage group.

Chest Wall Reconstruction Techniques

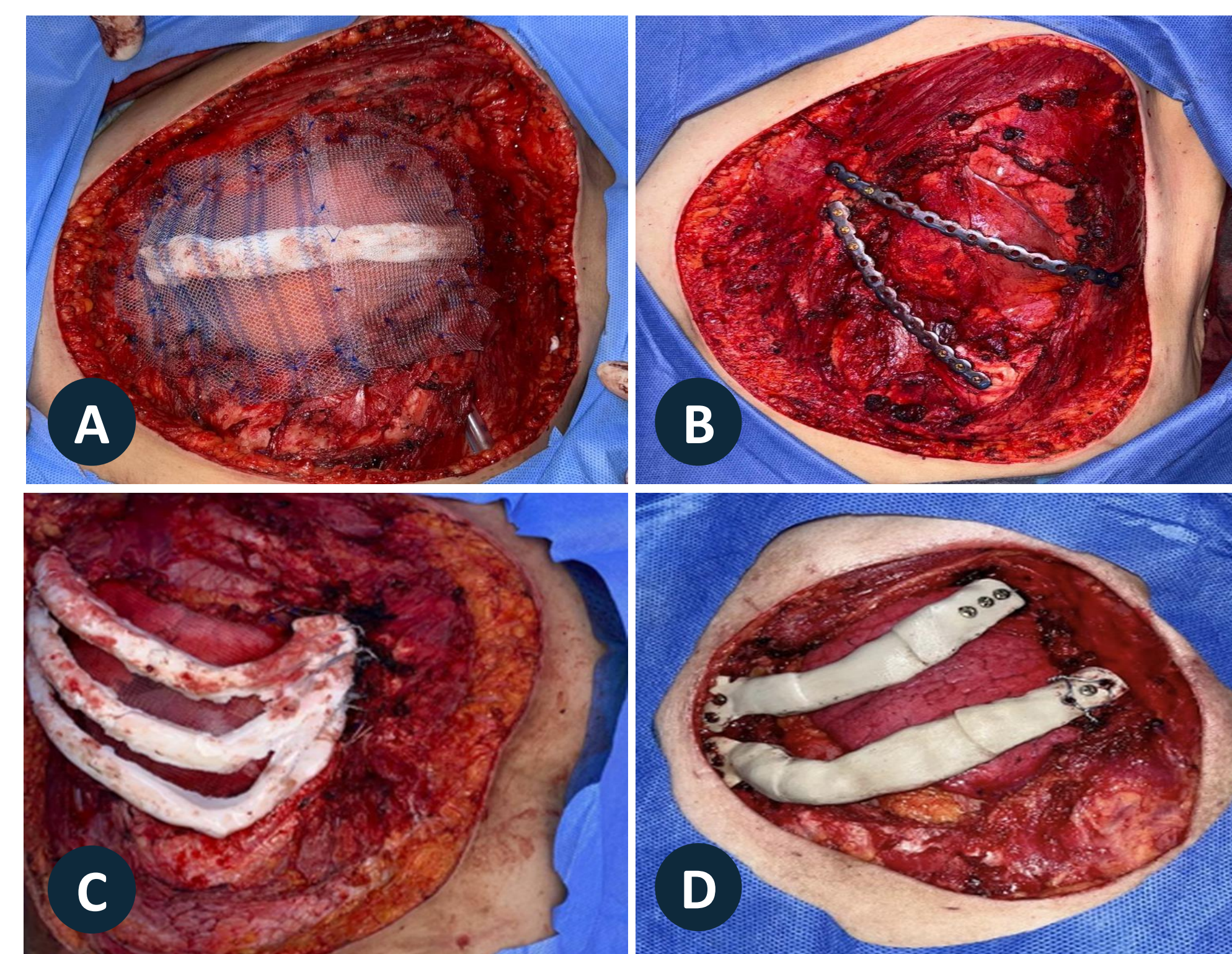


Figure 2. Chest wall reconstruction techniques employed at PGH. **(A) Birdcage MMA** (n = 4): methylmethacrylate molded over Penrose drains and sternal wires, reinforced with prolene mesh. **(B) Titanium plates** (n = 6): rigid rib and sternal fixation with prolene mesh reinforcement. **(C) 3D-printed mold MMA** (n = 6): a CT-derived negative mold shapes the same low-cost cement to patient-specific anatomy. **(D) 3D-printed PEEK** (n = 1): patient-specific neorib, radiolucent, lightweight and precision-fitted from preoperative CT.

Perioperative & Postoperative Course

Median operative time was **14.5 hours** (IQR 13.0–16.4), reflecting the complexity of wide resection and multi-layered reconstruction; **median postoperative stay was 9 days**. One patient (5.9%) required prolonged intensive care for severe pneumonia with thyroid storm and adrenal crisis (19 ventilator days, 49 ICU days); three others needed ventilatory support for under five days without ICU admission.



Figure 3. Median postoperative stay by technique (days).

Morbidity & Mortality

Birdcage reconstructions were notable for their safety profile, with no major complication, reoperation or mortality. The mold-assisted group had generally favorable results, though two patients experienced flap necrosis and one wound dehiscence. Titanium reconstructions were associated with isolated complications, including the single mortality. The one PEEK patient had an uneventful recovery and was discharged on day 7.

Table 2. Complications across four operative techniques

Technique	n	Complications	Reoperation	30-day mortality
Birdcage MMA	4	None	0	0
3D-printed mold MMA	6	Flap necrosis 2; dehiscence 1	1	0
Titanium plates	6	Flap necrosis 1; heart failure 1; thyroid storm and adrenal crisis 1	1	1
3D-printed PEEK	1	None	0	0

0

Infections,
Implant failures or
removals

70.6%

Patients with no
complications
(n = 12)

5.9%

Flap necrosis
(n = 3)

88.2 %

Negative
Resection Margins
(n = 15)

DISCUSSION AND CONCLUSION

One of the first institutional perspectives on chest wall reconstruction in a developing-country setting, where the repertoire expanded through necessity and ingenuity rather than budget.

Tumor burden, not implant choice, drove morbidity. Laterality and comorbidity did not predict adverse outcomes. Extent of resection did: defects ≥150 cm² or removal of more than three ribs meant longer operations and stays, while smaller defects with negative margins were discharged within 7–9 days.

Oncologic adequacy was preserved. Both positive microscopic margins involved aggressive tumors, one a malignant phyllodes, reflecting tumor biology rather than reconstructive failure. No death was caused by a reconstruction technique.

CONCLUSION: A NICHE FOR EACH CONSTRUCT

All four constructs proved safe and feasible, each filling a distinct niche — evidence that patient-specific technology can be adopted in a resource-limited setting without displacing the methods that made reconstruction possible in the first place.

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