

Recipient Vessel Selection in Patients with Poland Syndrome Undergoing Free Autologous Breast Reconstruction: A Systematic Review of the Literature and Proposal of Algorithm

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Introduction

- Poland syndrome is a rare congenital chest wall deformity often associated with hypoplastic or absent pectoralis muscles and thoracic vasculature.
- Microsurgical autologous breast reconstruction (ABR) may be required when implant-based or latissimus dorsi (LD) options are not viable.
- In ABR, recipient vessel selection is challenging in patients with abnormal anatomy.
- No prior review has systematically evaluated recipient vessels used in ABR for Poland syndrome.

Objective

To systematically review microsurgical ABR cases in patients with Poland syndrome and propose a structured algorithm for recipient vessel selection.

Methods

- Systematic review (Ovid MEDLINE, PubMed, Web of Science) following PRISMA guidelines.
- Inclusion: ABR with free flaps in Poland syndrome, with documented recipient vessels and outcomes.
- Data extracted: flap types, recipient vessels, complications, cosmetic outcomes.
- Continuous variables reported as weighted means with 95% CI.

Results

Reference	No. of Patients	Indication	Follow Up Period (months)	Flap Type	Recipient Vessel	Conducted Preoperative Vascular Imaging	Flap Complication	Aesthetic Result
Blechner 2013	1	PD, capsular contracture	NR	PAP	IM	No	None	"Satisfied"
Diocysius 2015	1	PD, capsular contracture	24	DIEP	TD	Yes (CTA)	None	"Highly Satisfied"
Huemer 2012	8	PD	NR	TRAM	TD (8)	No	Flap Loss (1)	"Exceptionally high satisfaction"
Longaker 1997	9	PD	NR	TRAM (6), superior gluteal (1), inferior gluteal (1), contralateral LD (1)	TD (8) Circumflex scapular (1)	No	Flap Failure & Venous Thrombosis (1)	NR
Malikpour 2023	1	Cancer	3	DIEP	IM	Yes (CTA)	Flap Hematoma (1)	"Very satisfied"
Wong 2004	1	Cancer	6	DIEP	IM	No	None	NR
Xu 2020	1	PD	6	DIEP	TD v., IM a. & v.	Yes (CTA)	Small Area of Flap Necrosis (1)	"Satisfactory"
Holm 2001	1	Cancer	NR	TRAM	IM	No	None	NR
Dohas 2014	1	PD	NR	ALT	TD	No	None	NR
Gustam 2007	8	PD	NR	SIEA (1), SGAP (4), IGAP (2), DIEP (1)	IM (9)	No	Venous congestion (2), hematoma (2), fat necrosis (1), cellulitis/dehiscence (1)	Range: Poor to Excellent
Liao 2005	1	PD	12	DIEP	IM	No	None	"Highly satisfied"
Musa 2015	1	PD	36	DIEP and SIEA	TD and IM	Yes (CTA)	None	"Highly satisfied"

Abbreviations: PD, Poland deformity; NR, not reported; a., artery; v., vein; TRAM, transverse rectus abdominis musculocutaneous; TMG, transverse musculocutaneous gracilis; DIEP, deep inferior epigastric perforator; SGAP, superior gluteal artery perforator; IGAP, inferior gluteal artery perforator; ALT, anterolateral thigh; Bilateral PAP, bilateral profunda artery perforator; SIEA, superficial inferior epigastric artery; LD, latissimus dorsi.
Note: If artery or vein not specified, both vessels were utilized.

	No. (%)
Total Patients	34 (100.0)
Free Flap Used	
TRAM	7 (20.6)
TMG	8 (23.5)
DIEP	6 (17.6)
SGAP	5 (14.7)
IGAP	3 (8.8)
DIEP + SIEA	1 (2.9)
ALT	1 (2.9)
PAP	1 (2.9)
SIEA	1 (2.9)
LD	1 (2.9)
Recipient Vessels Used	
Thoracodorsal only	18 (52.9)
Internal Mammary only	13 (38.2)
Both Internal Mammary & Thoracodorsal	2 (5.9)
Circumflex scapular	1 (2.9)

Abbreviations: TRAM, transverse rectus abdominis musculocutaneous; TMG, transverse musculocutaneous gracilis; DIEP, deep inferior epigastric perforator; SGAP, superior gluteal artery perforator; IGAP, inferior gluteal artery perforator; ALT, anterolateral thigh; Bilateral PAP, bilateral profunda artery perforator; SIEA, superficial inferior epigastric artery; LD, latissimus dorsi.

	No. (%)
Total Patients	34 (100.0)
Age, years (mean [95% CI])	31.9 (28.3–35.5)
Follow-up, months (mean [95% CI])	14.5 (4.2–24.8)
Indication for surgery	
Correction of Poland Deformity	31 (91.2)
Breast Cancer Diagnosis	2 (5.9)
Prophylactic Breast Cancer	1 (2.9)
Previous Implant for Poland Correction	14 (41.2)

Abbreviations: CI, confidence interval.

	No (%)
Total Patients	34 (100.0)
Flap Complication	7 (20.6)
Venous Congestion/Thrombosis	3 (8.8)
Flap Loss/Failure	2 (5.9)
Flap Hematoma	3 (8.8)
Flap Necrosis	2 (5.9)
Cellulitis/Dehiscence	1 (2.9)
Aesthetic Revision	5 (14.7)

Discussion

- Despite vascular anomalies in Poland syndrome, TD and IM vessels were viable in >90% of cases.
- Flap failure (5.9%) occurred in cases using TD vessels, likely due to subscapular venous anomalies.
- Preoperative CTA was underutilized but proved useful for detecting vessel hypoplasia and planning dissection.
- Intraoperative vessel changes were required even after imaging; surgeons should always have a backup plan in the setting of anomalous vascular anatomy.
- 41% of patients had prior failed implant-based reconstructions, supporting ABR as a durable alternative.
- Our findings support the use of a structured algorithm to guide vessel selection and improve outcomes, especially considering plastic surgeons may not encounter Poland syndrome until later in their training.

Conclusion

Microsurgical ABR can be successfully performed in Poland syndrome patients using TD or IM vessels in most cases. Pre-op imaging and a structured algorithm may improve outcomes and reduce flap failure risk.

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Vessel Selection Algorithm (Above).

