ANATOMIC BASIS OF THORACODORSAL ARTERY PERFORATOR-BASED FLAP: CADAVERIC AND ANGIOGRAPHIC STUDY

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INTRODUCTION

- "Like replaced by like'. Perforator-based reconstruction: Advance in volume replacement oncoplastic surgery.
- TDAP advantages: Proximity to recipient area, tissue resemblance with native breast tissue, reduces surgical time, less surgical morbidity.
- Cadaver labs offer real-time learning of vascular anatomy and flap harvesting techniques. Paucity of data on cadaver simulation for breast oncoplasty.

AIM: Study anatomic and vascular basis of TDAP (CD and CTA).

PRIMARY OBJECTIVE: To study utility of high-fidelity cadaver-based anatomical simulation for characterisation of TDAP for young surgeons training in oncoplasty.

SECONDARY OBJECTIVES:

- Determine course, precise location, diameter of TDAP.
- Analyze pattern of distribution of DP & NDP, analyse and compare pattern of distribution of TDAP in CD and CTA.

SUBJECTS AND METHODS

Cadaver radiologic comparative study from July 2021 to July 2023.

INCLUSION CRITERIA: Fresh cadavers (<24 hrs of death)/ Theil cadavers (frozen and thawed), Male/ Female cadavers ≥ 18y, **10 such (20 sides)**.

CTA: Female ≥ 18y with LABC (as part of metastatic work-up) along with CECT and bone scan (**23 patients**).

EXCLUSION CRITERIA: Age <18 y, previous surgery to axilla/breast, injury/ scarring CW.

ANALYSIS: Descriptive statistics - mean/SD and median/IQRs for continuous variabes and frequencies/ percentages for categorical variables. Group comparison for continuously distributed data - independent sample t-test, non-normally distributed data - Wilcoxon test. Chi-square test - group comparison of categorical data. p<0.05 considered statistically significant. Non-parametric data - Wilcoxon signed rank test used. SPSS V23 for analysis from MS Excel data recording.

Cadavers - soft (Fresh/ Theil)

→ Supine position, lateral elevation, 120deg shoulder abduction

→ Anterior border of LD marked

→ CD done as demonstrated

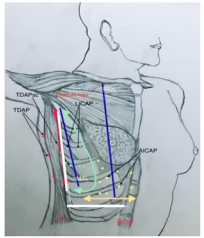
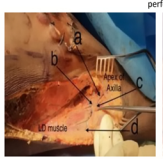


Image 1: Anatomical landmarks &location of perforators (basis of CD)



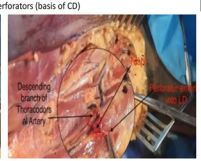
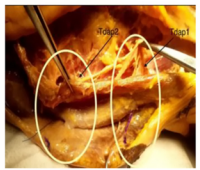


Image 2: Showing TDA & its branches;, a-Thoracodorsal artery ; b-Horizontal branch ; c- Lateral descending branch ;d-septocutaneous perforator passing anterior to LD border

Image 3: Showing TDAP originating from descending branch & piercing through LD belly to supply subcutaneous flap

Image 4: Shows course of TDAP-1 and TDAP-2 through the muscle belly and their origin from the TDA



CTA done with CECT (part of metastatic work-up) in 23 LABC patients → 90-120 ml non-ionic contrast (1.5-2 ml/kg body weight) at a conc of 300mg/ml. 4ml/s using 18G cannula (antecubital vein) → Thin section (0.6mm) angiographic acquisition → TDAPs identified → Parameters studied

- Number of DP and NDP
- Length
- Diameter
- Distance from apex of axilla
- Distance from anterior border of LD
- Relative distance of NDP from DP

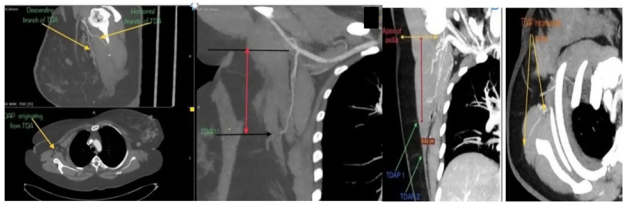


Image 5: CTA for TDAP

RESULTS

≥1 DP in CD on either side of 10 cadavers. In CTA, at least one TDAP identified in 45 out of 46 sides

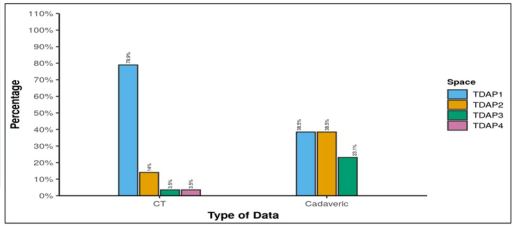


Figure 1: Majority of perforators detected in CT were TDAP1 ; in cadaveric study nearly 40 % of perforators were TDAP1 and TDAP2 each

Parameters	CD and CTA findings		p value
	CTA (N = 57)	CD (N= 52 in 10)	
Type of Perforator***	Frequency (%)	Frequency (%)	<0.001
Dominant	45 (78.9)	20 (38.5)	
Non-Dominant	12 (21.1)	32 (61.5)	
	Mean (SD)	**Mean (SD)**	
Length Of Perforator(cm)	2.71 ± 0.83	2.85 ± 0.55	0.167[3]
Diameter Of Perforator(mm)***	1.48 ± 0.32	1.10 ± 0.25	<0.001[3]
Distance From Apex Of Axilla(cm)	8.83 ± 1.46	8.30 ± 1.56	0.093[3]
Distance From Anterior Border Of LD(cm)***	0.84 ± 0.62	2.36 ± 0.87	<0.001[3]
Relative Distance of Non Dominant from Dominant from Apex Of Axilla(cm)	0.18 ± 1.63	0.29 ± 2.13	0.833[3]
Relative Distance of Non Dominant from Dominant from Anterior Border Of LD(cm)	0.16 ± 1.16	0.26 ± 0.96	0.788[4]

***Significant at p<0.05, 1: Chi-Squared Test, 2: Fisher's Exact Test, 3: Wilcoxon-Mann-Whitney U Test, 4: t-test [1]

Table 1: Comparison of CD and CTA findings.

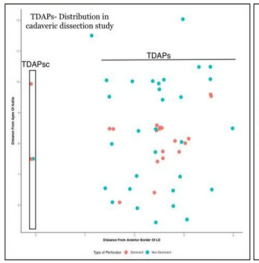


Figure 2: Scatter diagram of TDAP distribution in CD

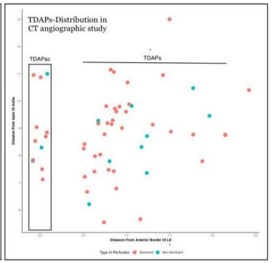


Figure 3: Scatter diagram of TDAP distribution in CTA

DISCUSSION

- Simulation is known to enhance learner experience.
- Here, TDAP was identified in 20 sides of 10 cadavers.
- Parameters assessed were comparable in CD and CTA.

Variable/ Measurement	CD(Mean ± SD)	CTA(Mean ± SD)	Literature ref.	Key notes
Length of TDAP(cm)	2.85 ± 0.55	2.71 ± 0.83	Tansatit et al: 3.0 ± 1.8	Comparable length in both modalities
Diameter of TDAP (mm)	1.10 ± 0.25	1.48 ± 0.32	Tansatit et al: 1.3 ± 0.3	Diameter larger in CTA; p value significant
Distance from apex of axilla (cm)	8.30 ± 1.56	8.83 ± 1.46	Tansatit et al: 9.8 ± 2.6 Heitmann et al: 8.0	Consistent with literature

- Systematic review: Lastoria et al (2025), emphasize on importance of robust studies on simulation-based learning → Improve surgical expertise and decrease complication → To focus on applicability of simulators in betterment of surgical technique and reduce complication. Cadavers are examples of high-fidelity simulation.

CONCLUSION

- Cadaveric simulation offers high-fidelity learning of key anatomical parameters for TDAP-based oncoplastic procedures.
- Anatomic and vascular parameters of TDAP have almost similar findings in CD and CTA.

LIMITATION

- In situ dynamic circulation could not be used in the cadavers.

STRENGTH

- Good sample size: 10 cadavers (hence 20 sides). Fresh/ Theil cadavers
- 23 LABC patients.
- 1:1 comparison of CD and CTA findings of TDAP.

Key: CD- cadaveric dissection
CTA: CT angiography

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