Case Report

Artesian Perforator Concept

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ABSTRACT

In this article, we describe the 'Artesian Perforator Concept', based on the idea that in clinical practice, there are multiple plexuses between perforasomes in addition to the supra-fascial direct and indirect linking vessels that are present within deeper soft tissue, which form part of a deeper vascular reservoir, the equivalent of a vascular 'aquifer'. We then demonstrate the use of this concept clinically for a 45-year-old male patient with median sternotomy wound dehiscence who was reconstructed using the Internal Mammary Artery Perforator and Lateral Thoracic Artery Perforator flaps.

KEYWORDS
Artesian Perforator Concept; Perforasomes; Vascular reservoir; Soft tissue reconstruction; Internal Mammary Artery Perforator flap; Lateral thoracic artery

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INTRODUCTION

With regards to perforator flaps, it is currently believed that if its perforators are divided or damaged, raising the perforasome as a flap is not possible. The Artesian Perforator Concept works on the premise that there are multiple plexuses between perforasomes in addition to the supra-fascial direct and indirect linking vessels[1] that are present within deeper soft tissue such as muscle, bone, tendon et cetera, which form part of a deeper vascular reservoir, the equivalent of a vascular 'aquifer'. ('Aquifer'; a geographical term referring to an underground water reservoir sandwiched between porous and non-porous layers). Here, we present a case to illustrate this 'vascular aquifer' concept.

CASE PRESENTATION

Informed consent was obtained for the publishing of the image/case described in this report. We used this concept clinically, in a 45-year-old male patient who had a coronary bypass artery graft via a median sternotomy wound with harvesting of bilateral internal mammary arteries but unfortunately, the wound dehisced leaving a 20 cm x 6 cm defect down to the ribs. This was briefly described in the senior author's article in 2016,[2] but in this article, this perspective is expanded upon, emphasizing the 'vascular aquifer'. Doppler examination assessment

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revealed optimal signals of the Internal Mammary Artery Perforators (IMAPs) bilaterally despite the absence of the bilateral internal mammary arteries. Peri-operatively, only the left 1mm 2nd IMA perforator was identified in the supra-muscular plane. The Lateral Thoracic Artery Perforator (LTAP) signal was located on doppler studies and then identified intra-operatively. When a microvascular clamp was used to occlude the LTA perforator in its supra-fascial plane, doppler studies still detected a strong signal in the 2nd IMA perforator. An Acland's test on the 2nd IMA perforator as it entered the subcutaneous fat showed a flow pattern from deep to superficial from the stem of the 2nd IMAP itself. Based on this, a left-sided 2nd IMAP flap was raised, in the supra-fascial plane along the axis of the 2nd IMAP and the LTAP, as a propeller flap and pivoted through 80 degrees before insetting into the pre-sternal defect. The post-operative period was uneventful, and the flap survived completely with no evidence of venous congestion. Follow-up at six months showed a completely healed wound with good color and contour match (Figure 1).

DISCUSSION

The IMAP flap was first described in 2006[2] and has evolved from the deltopectoral flap based on advances in perforator know-how [3]. While these vascular channels may not in their virgin state, act as a source vessel to sustain a flap of tissue via a perforating vessel, if inadvertently delayed after surgery, this network could enlarge to a sufficient size to collectively perfuse a zone of tissue via an overlying perforator which acts as an 'artesian well' to the deeper vascular aquifer. This concept is graphically illustrated as follows in



Figure 1: Eight months post-op image of the IMAP flap based on the lateral thoracic vessel, being perfused via the vascular aquifer.

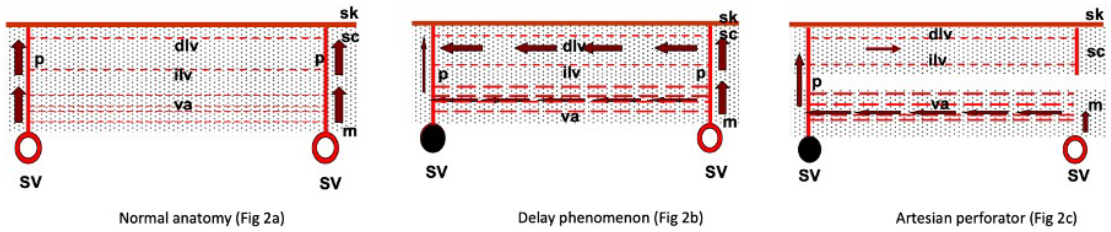


Figure 2 (a-c): Schematic illustration showing the evolution of the perforasome from normality (left image) to the development of a vascular aquifer following the division of the source vessel with the enlargement of both direct and indirect linking vessels (center image) and the elevation of a viable aquifer perforator flap (right image).

(Legend key: p – perforator; SV – source vessel; dlv – direct linking vessel; ilv – indirect linking vessel; sk – skin; sc – subcutaneous fat; m – muscle; va – vascular aquifer)

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Figures 2a-c, based on the well-studied 2nd internal mammary artery perforator (IMAP) and the lateral thoracic artery perforator (LTAP) systems[4].

CONCLUSION

The Artesian Perforator Concept presents an innovative approach to tissue reconstruction by recognizing the existence of multiple interconnected pathways within deeper soft tissues.

FINANCIAL DISCLOSURE

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this manuscript. No funding was sought or received for this work.

CONFLICT OF INTEREST

Non- declared.

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