

# 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<sup>1</sup> 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,<sup>2</sup> 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 2<sup>nd</sup> 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 2<sup>nd</sup> IMA perforator. An Acland's test on the 2<sup>nd</sup> IMA perforator as it entered the subcutaneous fat showed a flow pattern from deep to superficial from the stem of the 2<sup>nd</sup> IMAP itself. Based on this, a left-sided 2<sup>nd</sup> IMAP flap was raised, in the supra-fascial plane along the axis of the 2<sup>nd</sup> IMAP and the LTAP, as a propeller flap and pivoted through 80 degrees before inseting into the pre-

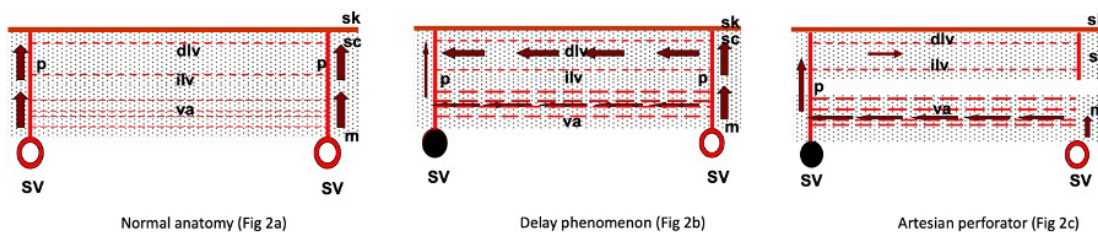
sternal defect. The post-operative period was uneventful, and the flap survived completely with no evidence of venous congestion. Follow-up at six months showed a completely healed wound with good color and contour match (Figure 1).

## DISCUSSION

The IMAP flap was first described in 2006<sup>2</sup> and has evolved from the deltopectoral flap based on advances in perforator know-how<sup>3</sup>. 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)

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

## 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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