Commentary on: The Layered Anatomy of the Nose: An Ultrasound-Based Investigation

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Nonsurgical rhinoplasty has become common practice for many plastic surgeons and related specialists, with increasing numbers of patients undergoing this procedure each year.[1] Despite often being promoted as a "noninvasive" alternative to surgical rhinoplasty, filler treatment of the nose is not without risk. The most serious complication that can occur is loss of vision, which is believed to result from an inadvertent intravascular injection around the nose. Given this rare, but catastrophic, outcome, our specialty must continue to emphasize safety protocols and identify potential ways to minimize this occurrence.

This article, titled "The Layered Anatomy of the Nose: An Ultrasound-Based Investigation,"[2] makes one such valuable contribution to our literature. By means of ultrasound analysis, the authors offer a unique description of layered soft tissue anatomy in the nose and its clinical relevance to injection safety for nasal filler. A total of 60 participants (28 males and 32 females) underwent real-time ultrasound imaging by a single reviewer. The nose was analyzed at 3 distinct levels: radix, mid-dorsum, and tip. At each point, soft tissue layers were assessed along with arterial patterns, including vessel depth and caliber.

CONSIDERATION OF VESSEL DEPTH AND LOCATION

We commend the authors for their study design and scientific findings, and believe this article deserves distinct praise for the practical value it provides for readers. For us, there are 2 essential points to take home (or rather to the "office"):

1. Deep injection alone (supraperiosteal or subperichondrial) does not guarantee the midline vessels will be avoided because these are unpredictable in depth.
2. Particular attention is required in the mid-dorsum where vessel depth is most unpredictable.

Ultrasound analysis at various levels of the nose identified vessels that were predominantly, but not exclusively, found in a superficial plane. When evaluating the radix and tip, the authors found the nasal artery to be in a superficial plane in 91.7% and 98.3% of cases, respectively. In contrast, ultrasound analysis at the mid-dorsum demonstrated the nasal artery location to be superficial in only 80% of participants.

In reading this paper from the lens of trying to avoid the rare complication of intravascular injection, we were especially interested in the few participants who demonstrated an atypical location of deep arterial vessels. Out of the 60 patients analyzed, only 1 had a deep radix vessel, while 10 had deep mid-dorsum vessels. We had hoped to come across data in which the authors identified potential key risk factors for deep nasal vessels, such as BMI, skin thickness, length, gender, or a multivariate analysis? No such data exist in the manuscript, and we can't help but wonder

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if this represents a missed opportunity, or a limitation of statistical analysis in such a small study population.

An important follow-up study would be to include a more comprehensive analysis of vascular anatomy throughout the nose. The authors limited their anatomic viewpoint to the midline, thus excluding vessels that are positioned laterally and outside from the ultrasound view. Clinically, this is of course important because injection sites for nonsurgical rhinoplasty are not exclusively performed in the midline. Furthermore, the images provided do not identify the largest artery in the nose, the subdermal vessel or an example of a supraperiosteal vessel, which, when shown at the midnasal dorsum and nasal tip, could provide a valuable understanding of the vascular landscape.

CONSIDERATION OF LAYERED SOFT TISSUE ANATOMY

In addition to evaluating vessel depth, the authors studied the soft tissue architecture of the nose. While we found their data of a layered architecture intriguing, the direct implications for injection safety are less apparent.

Ultrasound analysis showed that 100% of participants demonstrated a 5-layered architecture at the level of the mid-dorsum (vs the tip and radix where no such arrangement was present). The mid-dorsum 5-layered arrangement was found to exist in a location between 26.7% and 67.5% of the total nasal length, extending for a total distance of 13.5 mm (this represented an average of 11 mm below the radix and 13.5 mm above the tip). Interestingly, this arrangement was noted to be significantly shorter in females than in males (14.6 mm vs 18.8 mm), with no significant differences noted by age.

As we reviewed these data, we wondered about the relation between this 5-layered anatomy and the relative length of the nasal bones. Are we simply seeing a transition to a structured 5-layered architecture at the transition from nasal bone to septal cartilage, or is this unrelated? Similarly, might the midline caudal edge of the nasal bone represent the anatomic landmark for passage to what the authors deem as “mid-dorsum,” where 5-layered anatomy may be consistent, but arterial depth and orientation less predictable? Unfortunately, this question cannot be answered based on the current study, which was limited to soft tissue analysis only.

OTHER CONSIDERATIONS FOR REDUCING COMPLICATION RISK

Perhaps one of the most important questions raised by this study is whether ultrasound technology should be more commonly utilized in plastic surgery. Numerous studies have demonstrated the use of ultrasound to assess features such as nasal skin thickness or the underlying fat pad.[3,4] However, should the utility of this technology extend beyond anatomic assessment, and include guiding treatment? A recent example of this is the study by Lee et al, who demonstrated the application of ultrasound to identify the location of the supratrochlear artery prior to injection of glabellar rhytids in 42 patients. In 3 patients, injection was aborted due to the vessel being identified at the target area just below the dermal wrinkle line.[5]

Two potential barriers that may prevent widespread use of ultrasound in plastic surgery include cost and technical skill. Regarding costs, with advanced ultrasound technology and other real-time imaging technology on the horizon, these modalities may soon be readily available and affordable for most practices. Others have raised concerns about requiring uniquely skilled personnel in the office who can perform sonography. Having not applied this technology in practice ourselves, we can only predict that the learning curve for ultrasound use would be relatively short for most plastic surgeons, who generally already have an inherent skill set in manual dexterity, use of instruments, and a conceptual understanding of 3-dimensional anatomic relations. Indeed, this prediction is supported by the fact that the investigator performing the ultrasound analysis in this study had relatively little experience with ultrasound imaging (noted to be 2 years).[2]

Additionally, the authors note that canula injection “is usually performed from the tip and directed cranially and longitudinally parallel to the lateral dorsal arteries.” While we are unaware of any data to support this claim, this type of injection using a single entry point does raise concern for nonsurgical rhinoplasty which is rarely performed on patients with a straight dorsum. Intuitively, it seems difficult, if not impossible, to maintain a consistent depth (supraperiosteal or supraperichondrial) along a curved surface. In patients with a dorsal hump, maintaining consistent depth would be even more challenging; as one tries to overcome the apex of the hump, the canula or needle may naturally transition to a more superficial plane.

Lastly, the authors suggest using an additional maneuver of digital compression at the naso-orbital junction to help prevent retrograde flow of filler. Although they do not provide any data to support this claim, it is an interesting approach worth highlighting. This is something we support in theory, and a maneuver we use when injecting around the glabella (with compression on the superior orbital rim). The true impact on this simple and practical maneuver is something we would encourage our specialty and related fields to further investigate, in efforts to minimize devastating outcomes of filler.

Overall, we thoroughly enjoyed reading this article and believe the authors have made an important contribution to our literature. This study brings to light various implications for a common surgical technique and highlights important safety

measures to avoid inadvertent intravascular injections. We are eager to see future studies that provide a more comprehensive map of the vascular landscape, as well as consideration of imaging modalities such as real-time ultrasound that can help guide injections more safely. This study adds significant value to aesthetic surgeons' approach to safer soft tissue filler-based rhinoplasty, and we encourage readers to consider incorporating these findings into their practice.

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