Thank you very much to the editors for the invitation to comment on the cadaveric study, “An Anatomic Appraisal of Biplanar Muscle-Splitting Breast Augmentation.”1 I commend the authors for going back to the anatomy lab to further elucidate the nuances associated with this relatively new approach to breast augmentation. This laboratory study aims to identify a safe zone for performing the biplanar muscle-splitting (BMS) augmentation mammoplasty. I would like to offer my compliments and complements.

First let me compliment the authors on a well-structured study and an honest presentation of the weaknesses of the study and areas for future research. Let me also say that I have no personal experience with the BMS technique.

Before delving into the merits of the article, it is instructive to revisit the pectoral nerve anatomy to avoid confusion interpreting the literature and this study. The anatomy of the pectoral nerves is a bit confusing. The classic description has the pectoralis major innervated by two nerves; the lateral pectoral nerve and the medial pectoral nerve.2-7 Some authors describe three separate nerves.8-11 One author describes four different nerves.12 The nomenclature can cause confusion as well, anatomists name the nerves according to their origin from the brachial plexus. Unfortunately the course of the medial pectoral nerve is lateral to the lateral pectoral nerve. A very detailed and wonderfully illustrated study of the pectoral nerves by David et al deserves special attention by any aspiring surgeon of the pectoral region.9 In it, they describe a superior, middle, and inferior branch consistently found during 26 brachial plexus dissections. Most importantly the upper two branches (classically referred to as the lateral pectoral nerve LPN) will only be seen in the axillary approach. The inferior branch is commonly called the medial pectoral nerve (MPN). According to David et al. it is this branch that either pierces the pectoralis minor (Pm) 65 percent of the time or passes around the lower border of the Pm 35 percent of the time. It is here that breast augmentation in a submuscular location sometimes runs into trouble. Quite often the surgeon encounters one or two distinct branches of the MPN, one or two through the muscle or around. These are not the medial and lateral pectoral nerves, merely two branches of the medial pectoral nerves.

The authors provide a detailed analysis of their anatomic dissection to show a fairly repeatable location for the nearest nerve as it relates to point CS. Not so from point MS. In fact they only say the average distance from MS to the nearest nerve is 13.37 cm. Macchi et al., whom they cite, found that same distance averaged 10.3 cm.13 The authors apparently measured this distance but fail to present raw data or the range for MS to the most medial nerve branch. I would wonder whether and what percentage of these distances are too short for implant placement.

The first paragraph in the Results section addresses the shortest distance from CS to the penetration of the first major branch of the lateral or medial pectoral nerve. This seems quite improbable as I described earlier. The LPN is very high near the pectoral insertion. I believe they are looking at medial and lateral branches of the medial pectoral nerve. Regardless, the gist of the study is to avoid any neural damage.

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Measuring from CS below could certainly have a longer distance while the nerve is still somewhat closer to the sternum when measured from the higher MS point. This of course would have serious implications for placement of an implant. The final sentence in the Results section’s first paragraph states that “The distances to the first major branch increased from caudal to cranial positions, from the lateral edge of the sternum.” However, I believe they intended to state that it “decreased.”

Early in my training one of my mentors, Dr Benjamin Cohen, lamented one of the most difficult things to do in plastic surgery is to intentionally cut a nerve. Most of us have certainly been there while performing a subpectoral breast augmentation and faced with a medial pectoral nerve (MPN) or nerves piercing the Pm and entering the underside of the pectoralis major (PM). One must decide which is best for the patient. Should one sacrifice the MPN or preserve it and have a cord impinge on the implant with potential for postoperative discomfort or eventual failure of the implant caused by a long-standing fold? Or might the nerve cause an unnatural shape to the implant?

Submuscular or partial submuscular breast implant augmentation is by its very nature a balancing act. There is the muscle force vector acting from above and various fascial planes that may be weak or weaken with time below and laterally. A totally submuscular augmentation will trap the implant high. Dividing a portion of the PM creates a force vector that varies from straight down when the muscle is divided up a ways on the sternum, to a lateral force if only some of the costal border is divided often resulting in lateral displacement over time.

The article is quite clear on the muscle anatomy, recognizing the many anatomical studies as well as the plethora of variations. I’m not sure whether the muscle anatomy and anomalies are germane, since only in elevating lateral elements such as the Pm or other PM variants or “slips” does one create a lateral force vector that would potentially move the implant medially as we have shown.14-19 In the BMS technique those muscles are always posterior to any implant. The study design appears reasonable. The authors note the weakness of the small sample size. Their surgical dissection and their novel “CS” use in BMS pocket design is noted.

The Discussion section centers on the value of the BMS technique and a rather robust defense of it. I agree that avoiding detachment of the pectoralis major from the costal margin medially is likely to decrease dynamic breast deformity (DBD), as this is obviously the result of the detached distal end of the pectoralis major pulling the overlying tissues and skin, otherwise known as an animation defect. However in a standard dual plane technique if one doesn’t release the muscle medially enough there is ample opportunity for visualization of the muscle contracting. So there are two types of DBD. One from a detached muscle pulling on overlying skin, the other from muscle contraction displacing the implant. Which then begs the question, is the authors’ finding of no DBD which they ascribe to preservation of all PM attachments instead occurring because the superior medial PM is denervated or because the implant is no longer under the muscle at all? To their credit this is mentioned later as a possibility. I’m not sure a lateraled breast is a great compromise to eliminate any DBD.

My review of the literature regarding the precise innervation of the PM reveals many different perceptions. It certainly is unclear if the sternal head is innervated primarily by the medial or lateral pectoral nerves. Most likely, as with pectoral anatomy in general, it is variable. If true then dividing a large portion of PM and leaving the MPN in the lower section most likely divides all the innervation to much of the sternal head of the PM in some unknown portion of patients and possibly a large group. The authors are unsure if this is true as well.

BMS breast augmentation appears to be a worthy attempt at tackling some of the nagging problems with retro muscular breast augmentation. And this study is an ambitious attempt at making the technique safer and more quantifiable using science and not conjecture. I applaud the authors for this. In my humble opinion it would be fascinating to stimulate the medial pectoral nerves intra operatively in a large group of patients and document sternal PM action. I would also like to see long-term independent observations of the BMS technique in regards to lateral implant displacement as well as whether the implant stays under the medial muscle remnant.

Compliments to the authors. I hope my complements are helpful to the readers.

Disclosures
The author declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Funding
The author received no financial support for the research, authorship, and publication of this article.

REFERENCES