Table 1. Case Report Summaries of Three Patients Who Underwent Pacemaker Insertion via an Inframammary Approach*

Patient Age (yr)	Symptoms	Findings	Operation Duration (min)	In-Patient Stay (Days)
23	Syncope	Congenital third-degree atrioventricular block	90	1
22	Syncope	Intermittent third-degree atrioventricular block	80	1
17	Syncope	Mobitz II atrioventricular block	90	1

*A dual-chamber sensing and stimulating pacemaker was used for all patients.

morbidity of the procedure. The total operating time is similar to that of standard cardiac pacemaker placement. Plastic surgeons and cardiologists should be aware of the potential benefits of collaboration when young women require cardiac pacemakers. Placement of the device under the breast mound via aesthetically placed incisions that have a low risk of abnormal scarring can improve cosmetic outcome and minimize adverse psychological sequelae in this challenging patient group.

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DISCLOSURE

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Peri-Implant Gas following Air Travel to High Altitude

Sir:

Anecdotal reports of patients noticing transient changes in their augmented or reconstructed breasts during air travel, or travel to high altitude, are well known to plastic surgeons, a few of whom have written letters to medical journals describing their patients' complaints.[1–3] Far more discussion is available on the Internet. Despite an absence of documentation in the medical literature, the concept of implant expansion, leading to explosive rupture, during flight is so fixed in the popular culture that it was tested on the television show *MythBusters*. On that show, only minimal expansion of a silicone implant was achieved in a hypobaric chamber set to simulate an altitude of 35,000 feet, far higher than the 8000-feet equivalent of a commercial airline cabin.[4] Because the effect was so negligible, the myth was re-busted on a second episode after viewers questioned the original methodology.[5]

I recently encountered a case that fortuitously demonstrated the actual cause of the sensations noted above. A 36-year-old woman who had undergone bilateral mastectomy with silicone implant reconstruction 5 years earlier presented to me at a breast imaging center in a mountain town in Colorado. Her complaint was of unusual sensations in her reconstructed breasts for 1 day. She had no other medical or surgical history related to her breasts, but it was later revealed she had traveled by plane from New York the previous day, landing in Denver and then proceeding by car to her mountain home. Results of a workup with breast ultrasound were negative, but she proceeded to the nearby hospital for a computed tomographic scan of the chest to evaluate some mild shortness of breath. The chest scan was negative, except for a finding in the breasts. A small amount of gas could be seen surrounding the implant, within the implant capsule. Selected images from that study are shown in Figure 1.

This case demonstrates that, rather than causing expansion of the implant, decompression causes dissolved gas in the blood to come out of solution and fill

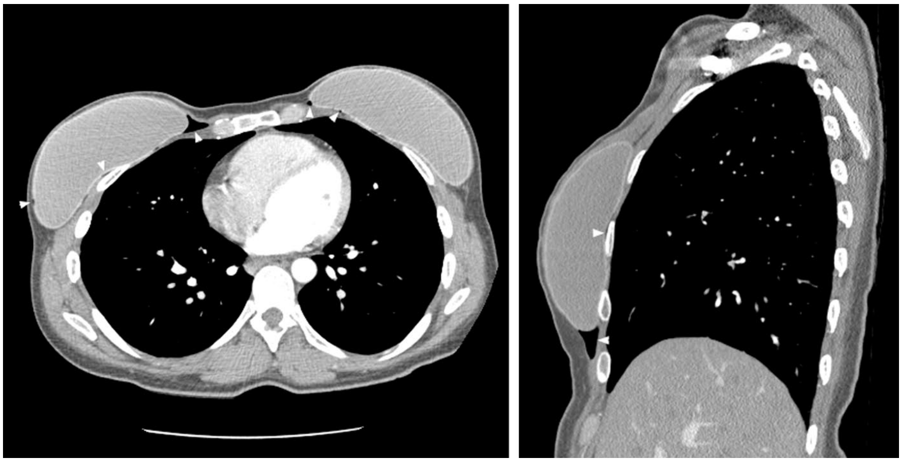

Fig. 1. A 36-year-old woman who had undergone bilateral mastectomy and silicone implant reconstruction 5 years earlier presented with history of air travel the previous day. A computed tomographic scan was obtained for mild shortness of breath. (*Left*) Selected axial slice through the level of the breasts from a scan of the chest. Pockets of intracapsular gas are demonstrated adjacent to each silicone implant (*arrowheads*). The largest pocket is medial to the right implant. (*Right*) Selected sagittal reconstruction through the reconstructed right breast shows the same findings (*arrowheads*), with the largest pocket of gas inferior to the implant. No other abnormality of the breast tissue, implants, or remainder of the chest was demonstrated by the study.

a potential space between the implant and the capsule. Because the compressibility of tissue is much greater than that of silicone gel (or saline), the surrounding tissue expands to a much greater degree than does the implant. This creates an empty space between the capsule and the implant. Dissolved gas from blood comes out of solution to fill this vacuum. The gas is gradually resorbed after pressure is restored at landing, causing the symptoms to resolve. In this case, the patient did not return to sea level but stayed relatively depressurized by landing at 5000 feet above sea level and immediately traveling over a 10,600-foot pass to end up at an elevation of around 8000 feet.

A second case of peri-implant gas, demonstrated on the screening mammogram of a flight attendant, is shown in Figure 2. The examination was obtained in Denver on an asymptomatic patient who had been augmented many years earlier. None of her previous mammograms had shown gas.

These appear to be the first documented cases showing this phenomenon. A literature search revealed only one article looking at the effect of high altitude on implants. In this in vitro study,[6] a series of implants were bathed in nitrogen gas at pressures simulating an ocean dive of 60 feet; the pressure was then decreased to simulate an altitude of up to 30,000 feet. Nitrogen gas diffused into the implant during the dive phase, and then the gas bubbles expanded during the flying phase, resulting in mild expansion, but not rupture, of the implants. Although the authors correctly hypothesized the importance of nitrogen gas in decompression, given the evidence presented here, they were slightly off the mark.

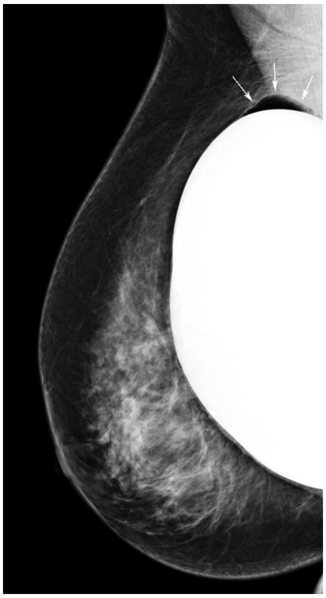

Fig. 2. Mediolateral oblique screening mammogram. Air is demonstrated superior to a retroglandular implant within the implant capsule (*arrows*). The patient is a flight attendant.

The process illustrated here is analogous to the physiology behind decompression sickness (“the bends”). In that phenomenon, dissolved gas in the blood, primarily nitrogen, comes out of solution and collects in body cavities, most commonly large joints, causing pain and other adverse effects. As such, the question posed

by one letter writer a decade ago[2] is answered in the affirmative. The symptoms experienced by his patients were, in fact, due to "bends of the breast." Notably, there is no risk of implant rupture.
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Supraclavicular Nerve Graft Interposition for Reconstruction of Pediatric Brachial Plexus Injuries

Sir:

Interposition nerve grafting is an important tool for reconstructing pediatric brachial plexus injuries. Conventional donor nerves, such as the sural, medial/lateral antebrachial cutaneous, saphenous, and superficial radial nerves, have been used with good success. With a relatively small diameter, however, several segments are required for large proximal reconstruction. In addition, nerve harvest translates into additional incisions, sensory loss over the extremity, and the potential need to change patient positioning. The supraclavicular nerve, a sensory nerve derived from the C3-C4 cervical roots of the superficial cervical plexus, offers many advantages: it is already in the operative field and easy to locate with a predictable anatomical pattern, and has a well-matched caliber for larger proximal targets and smaller distal targets, excellent length, and minor donor-site morbidity. In this article, we describe the technical use of the supraclavicular nerve in pediatric brachial plexus reconstruction and highlight some of its potential advantages.

A 6-month-old patient with minimal improvement of a right Erb obstetrical palsy underwent brachial plexus exploration. A skin incision was made along the lateral aspect of the right sternocleidomastoid muscle down to the supraclavicular region and followed laterally along the clavicle. A subplatysmal flap was reflected laterally. The supraclavicular nerve was identified just posterior to the sternocleidomastoid muscle, with large and well-defined intermediate and lateral rami (Fig. 1). The C5 and C6 nerve roots were noted to be intact, with C5 demonstrating normal fascicular architecture proximally. Significant neuroma enveloped C5 and C6 at their confluence, the suprascapular nerve at its takeoff, and the proximal portions of the anterior and posterior divisions of the upper trunk. Electromyogram recordings confirmed significant supraspinatus electrical activity with distal stimulation of the suprascapular nerve, as well as appreciable biceps and deltoid electrical activity with stimulation distal to the scarred fascicles of the anterior and posterior divisions, respectively.

Operative treatment began with neuroma resection. The lateral ramus of the supraclavicular nerve was chosen for interpositional nerve grafting, given its favorable branching pattern. A single nerve coaptation was performed proximally between the cut end of the C5 root and the large trunk of the lateral ramus. Eight branches emanated distally from the graft, three of which were coapted to the suprascapular nerve, three to the anterior division of the upper trunk, and two to the posterior division of the upper trunk (Fig. 2). The surgical site was then closed in a layered fashion.

Cadaveric studies have highlighted the supraclavicular nerve's predictable anatomy, originating as a common stem posterior to the sternocleidomastoid muscle with 97 percent of specimens possessing medial and lateral rami and 49 percent containing the additional intermediate ramus.[1] The medial, intermediate, and lateral rami provide sensation over the sternal angle, anterior chest, and shoulder, respectively. The main rami are flattened structures with an average diameter of about 2.5 to 2.7 mm and contain two to five fascicular

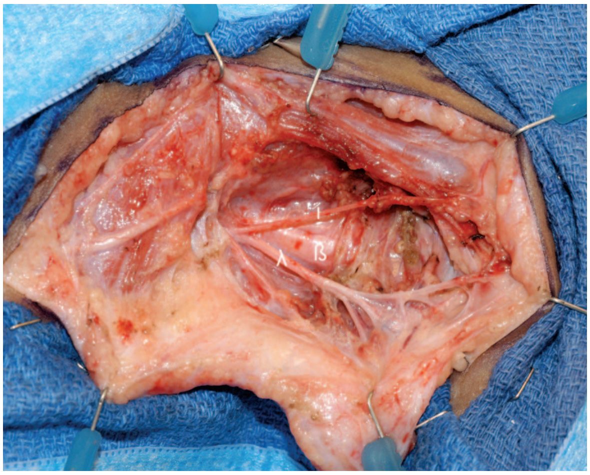

Fig. 1. Intraoperative photograph of the surgical approach to the brachial plexus reconstruction. Note the close proximity of the intermediate (ι) and lateral rami (λ) of the supraclavicular nerve to the scarred in brachial plexus (ß).