Editorial Commentary: Fill It up: The Fate of "Absorbable" Implants

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Abstract: Surgeons make conscious decisions daily regarding implants. But do they really know what happens in the body to "absorbable anchors?" How long does it take to resorb, and what fills the space left behind? Absorbable materials can be very different, and well-done studies are important to help us understand the process and to guide our decisions.

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We tend to think biocomposite suture anchors are better than the old poly-L-lactic acid anchors, which took many years, if ever, to dissolve, only to leave fibrous mush behind. But how much do you know about your particular anchor? In this issue of *Arthroscopy*, Sugaya, Suzuki, Yoshimura, Tanaka, Yamazaki, Watanabe, Iwaso, Inaoka, Sugimoto, Matsuki, and Mikasa (a veritable who's-who list among Japanese orthopaedic surgeons) present a paper entitled "Osteointegration of a Biocomposite Suture Anchor After Arthroscopic Shoulder Labrum Repair."[1] This study, sponsored by Smith & Nephew, was part of the regulatory approval process for their new OSTEORAPTOR biocomposite suture anchor to gain marketing approval in Japan. The anchor is made of a composite of poly L-lactide-co-glycolide (PLG)/calcium sulfate/β-tricalcium phosphate (β-TCP). Although we have seen other anchors with PLG/β-TCP biocomposites, the calcium sulfate, which is known to facilitate bone formation, is the new addition for this anchor.

The authors obtained computed tomography (CT) scans of 37 patients, evaluating 148 anchors 2 years after implantation in the glenoid labrum. They saw functional improvement in outcome scores for this patient population, but that was not the point of the study. What they did observe was very strong evidence of ossification and replacement of the anchors with bone, demonstrating true osteoconductivity. This was measured on CT scans using Hounsfield units for tissue density. Ninety percent of these anchors showed some ossification, evident to varying degrees, whereas only 20% of the anchor holes had some soft-tissue density. This translates to strong evidence for bone replacement 2 years after implantation in the glenoid.

How does this compare with other studies, and what we know about biocomposite suture anchors? Barber et al.[2] evaluated a previous PLG/β-TCP biocomposite anchor and showed some evidence of new bone formation in 71% of anchors a year later at 3 years. Milewski et al.,[3] in a study we performed at the University of Virginia with similar materials, demonstrated new bone formation in 47% of anchors. Those were toggle-type anchors that allowed some micro-motion and space around the anchor at the insertion site, perhaps inhibiting bone formation. With the little bit of motion at the anchor site, the study by Milewski et al. showed 55% had some evidence of hole widening whereas the current study, which had the cylindrical-shaped anchor and filled the hole more completely, had only 32% evidence of hole widening. The difference, of course, is what actually fills this hole, as some element of hole widening is common as the resorption process proceeds. Resorption of these materials is a complex biochemical process that is dependent on many factors, not only the biochemical makeup of the anchor. Porosity is important, and what the breakdown products and pH are as these materials dissolve. Phagocytosis by macrophages and bone resorption can all be part of the picture. It is one thing for

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a material to dissolve in the body, but it is an entirely different thing for it to be replaced by bone. We all learned this the hard way, with poly-L-lactic acid implants that were never replaced with bone.

Also important is how long this takes to occur with respect to the time needed for healing of the reattached tissue to the native bone. It is possible to overshoot the goal of rapid resorption of materials and bony replacement. Smith & Nephew, the creator of this anchor, had trouble with an interference screw many years ago that had to be pulled from the market due to too-rapid absorption in some cases.[4-6] It interesting to learn from these experiences how these materials can even behave differently in different anatomic sites, as well as differently in animals compared with humans.[7]

Why does this matter? The concern is with anchor placement that if these are not resorbed and replaced by bone that the remaining holes would be a fracture risk.[8-10] Certainly in a revision situation any holes encountered would be problematic. Adding more anchors in a revision scenario only compounds the fracture risk. Certainly, revision glenoid labral repair that then has a bony Bankart fracture becomes a completely different scenario. It is important for the reader to understand that not all biocomposite anchors are the same. They are different chemical compositions and will have different resorption patterns, timelines, and ability to be replaced by bone. Although this certainly is an industry-sponsored study, it is helpful to see true evidence in humans of new bone formation in 90% of these anchors as they dissolve in actual clinical use and over a timeline that is desirable.

What do we have available as surgeons? Well, biocomposites, as stated, are not all the same. It is helpful to study each of them to support some of the industry claims in marketing. Other options of all suture anchors may carry indirect risks of cyst formation and secondary fracture.[11] One concern with all suture anchors is the pumping action of joint fluid down along the suture into the bone, creating erosion and a cyst.[12,13] A biocomposite anchor that fills the hole may offer advantages in this situation. Some of the all-suture anchors have gone to smaller and smaller holes in the bone to help address this problem. Comparative studies with CT scans that are done in the manner of this current article would be helpful. Then, surgeons can make an educated choice about anchors.

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