Oncoplastic Surgery for Breast Cancer

The New State of the Art in Breast Surgery (Part 1 of 2)

By Cary S. Kaufman, MD, FACS

Ask almost any breast surgeon to describe the goals of an ideal breast cancer operation and the answer often would be the same: First, the surgery would successfully eliminate the cancer, and second, the cosmetic result would show the least evidence of the surgical procedure.

With the increased use of oncoplastic surgery (OPS), many patients are achieving these dual benefits today with increasing evidence of efficacy.[1] Each patient is unique, and even the most skilled surgeons cannot guarantee good cosmetic results for all their patients. Nor is every patient a candidate for OPS. But evidence is accumulating that breast-conserving surgery (BCS) with OPS eventually will become a mainstream option in breast cancer surgery. As awareness spreads nationwide that good to excellent cosmetic results are achievable with breast cancer surgery, most eligible women will want and expect those results.

So, how did we get to this point? How does OPS challenge our usual thinking about breast cancer surgery? And how might surgeons who haven't yet mastered OPS join the OPS community? What are the political issues associated with OPS? These and other questions will be reviewed in this 2-part series.

OPS Meets a Need

Since the 1970s, breast cancer surgeons have been striving to improve the cosmetic results of breast cancer surgery in a way that wouldn't compromise oncologic safety and effectiveness. Yet the size of most cancers at presentation before that time precluded any surgery with a less maximal approach than mastectomy.

As women became more aware of self-examination, patients with smaller tumors presented themselves, and the opportunity for breast conservation emerged. Early proponents of BCS were considered outliers.[2] Advocates such as Rose Kushner pushed for a 2-step procedure, in which a mastectomy wouldn't immediately follow a positive surgical biopsy.[3] During this decade, women were asserting their right to be respected as equals to men in every arena of society, from their workplaces to their homes to public life. In keeping with the times, women began making their feelings known about the often devastating effect that breast cancer surgery was having on their self-image, their relationships, and their lives in general.[4]

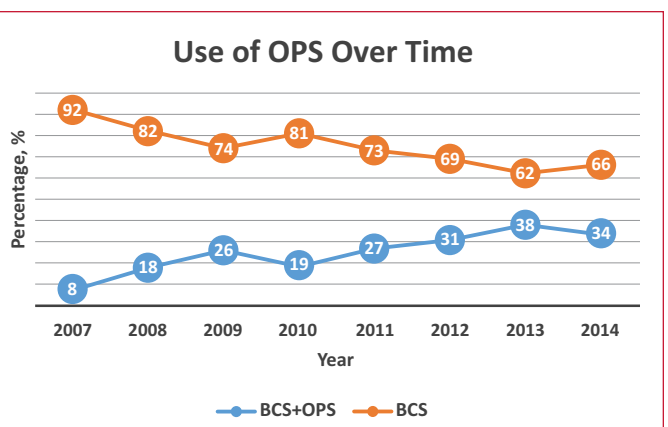

Figure. Percentage use of OPS for BCS at MD Anderson Cancer Center, 2007-2014.[1]
BCS, breast-conserving surgery; **OPS,** oncoplastic surgery

Driven both by a changing society and technological improvements, BCS emerged during this period. In the 1980s, breast conservation was made possible by a combination of advocacy, increased use of breast self-examination, and improved breast imaging finding cancers small enough for that procedure. As pioneering oncoplastic breast surgeon Gail Lebovic, MD, put it, "These smaller, less aggressive tumors could then be treated with smaller, less aggressive surgeries."[4]

Breast-conserving surgery represented a major advance over the radical and modified mastectomies that dominated breast cancer treatment before that time. Long-term studies confirmed that breast conservation was just as effective as mastectomy with regard to overall survival rates.[5,6]

Surgeons found that BCS was a dramatic cosmetic improvement on their previous results with mastectomy. Although not nearly as disfiguring as a mastectomy procedure, breast conservation still fell short of the two goals of breast cancer surgery, leaving some 30% of patients with a visible cosmetic deformity.[7] When seroma fluid absorbed and radiation followed lumpectomy, the cosmetic result often would suffer.[8] Common effects included an indentation where the cancerous tissue had been removed, deviations in the nipple position, and other retractions or distortions in the breast's shape or contour.

However, most surgeons believed that a lumpectomy cosmetic defect was a small price to pay for curing breast cancer while avoiding a mastectomy. The final cosmetic result often was only visible after radiation was completed. Many surgeons believed it was the radiation that caused the resulting deformity rather than the surgical excision.

In the 1990s, a variety of reconstructive techniques were being developed, including immediate breast reconstruction at the time of mastectomy.[9] Plastic surgeons, and later breast surgeons, took on the challenge of how to improve upon or even avoid the post-lumpectomy cosmetic defect. The effort led directly to the development of OPS, also called "breast-conserving surgery plus reconstruction" or BCS+R. The "plus" implies a basic truth about breast cancer surgery: It is much easier to prevent cosmetic damage as you plan and execute breast surgery than it is to fix any problems you created with a subsequent procedure.

OPS began in France in the 1980s, although the term was coined by Werner Audretsch, MD, in Germany.[10] During the following decade, OPS spread to South America and then the United States.

Today, with women looking forward to a long, healthy life after their breast cancer surgery, it is more important than ever to offer them a treatment option that preserves their quality of life and their sense of attractiveness and femininity. OPS is well suited to these times, and the data reflect this reality. A recent study of 9,861 patient records conducted at the University of Texas MD Anderson Cancer Center, in Houston, showed that the number of oncoplastic procedures performed there more than quintupled from 2007 to 2014 (Figure). The increasing demand for OPS becomes even clearer when you consider that by 2014, oncoplastic procedures represented 33% of all breast-conserving operations performed at MD Anderson.[1]

OPS Issues: What's Real, What's Not

Certain concerns about OPS have been raised when this surgical option is

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discussed. The 4 most common issues are:

1. **the oncologic safety and effectiveness of the approach;**
2. **its effect on postsurgical radiation treatment and targeting;**
3. **the issues of handling positive margins when tissues have been rearranged; and**
4. **dissecting into noncancerous tissues during cancer surgery with the risk for spread.**

Once the cancer is removed, many surgeons feel any further dissection into new planes of uninvolved tissues to reconstruct the breast may spread cancer cells into those tissues. But the oncologic safety and effectiveness of OPS have been confirmed by multiple studies. Most recently, a systematic literature review published in the *Annals of Surgical Oncology,* in 2016, analyzed 55 studies on this topic.[11] The research encompassed a collective 6,011 OPS patients, of whom about 83% had been diagnosed with either T1 or T2 invasive ductal carcinoma. The mean follow-up period of the studies was 50.5 months. The review found high rates of overall and disease-free survival and low rates of local recurrence, distant recurrence, positive margins, re-excision, conversion to mastectomy, and complications (Table). **The authors said their large study confirmed "the oncologic safety of this procedure in patients with T1-T2 invasive breast cancer."**

The MD Anderson study mentioned above, published in the same 2016 issue of the *Annals of Surgical Oncology*, compared patients who had received OPS with patients who had undergone BCS alone, total mastectomy alone, or total mastectomy with immediate reconstruction. The retrospective cohort research found that OPS patients "are not disadvantaged in terms of complications and short-term (3-year) outcomes" compared with the other patient groups. In fact, they found that the OPS group had a lower rate of positive margins (5.8% vs 8.3%).[1]

Another concern with OPS is the ability to treat and target radiation to the appropriate location when tissues have been rearranged. This is related to the difficulty of targeting radiation treatment based on seroma formation. When using only seroma location to target post-lumpectomy radiation, OPS creates seromas unrelated to the location of the excised cancer that do not need focused radiation treatment.

There is concern about the accuracy of targeting radiation since the effective dose of radiation is volume-related, which is calculated using the third power of the radius ($v=4/3r^3$). Small increases in target radius yield large increases in total radiation dose. When using conventional targeting (such as seromas after OPS), planners may call for treating target volumes much larger than the actual lumpectomy site because they are uncertain just where the tumor site actually is located after tissue rearrangement. As a result, healthy tissue may be irradiated as well, which may worsen the cosmetic outcome and harm the neighboring tissues of the area treated. Even when surgical clips are used, many radiation oncologists still target the seroma because they may believe clips may migrate or there may be ambiguity whether the clips mark the target or were used for hemostasis.[16]

The ordinary methods for identifying the tumor cavity such as postsurgical seroma and clips placed during surgery are, at best, inexact guides to the surgical site; at worst, they can be quite misleading. Clips can migrate after surgery; the breast tissue orientation may change with gravity; and seromas can form far from the site if there was any tunneling. OPS may worsen the seroma problem because of the tissue arrangement done by the surgeon and the seroma associated with it. With or without OPS, the seroma for radiation treatment may be an unreliable surrogate for the tumor site.

A novel, 3-D surgical implant has been used to target the lumpectomy tumor bed without targeting the OPS-mobilized tissues and has been helpful in addressing these concerns.[17] The 3-D implant targeting the original tumor site is sewn to the lumpectomy cavity, allowing it to move with and continuously identify the target site. The implant is a bioabsorbable spiral sphere that has 6 titanium clips attached to it (BioZorb, Focal Therapeutics, Inc), making it easy to visualize with standard clinical imaging equipment. When the framework is eventually absorbed by the body over the course of a year or more, the clips remain behind to mark the site for long-term follow-up. Research has confirmed the implant's effectiveness for targeting both OPS patients and those with standard lumpectomies.[18,19]

The third area of concern about OPS involves the issues of positive margins found after surgery. Despite all efforts, no BCS can be performed without some patients having a positive margin. Re-excising the site of the positive margin may be more difficult after OPS due to tissue rearrangement and obliteration of the lumpectomy cavity.

Several methods have been developed to manage this issue. Some surgeons place specific sutures on the lumpectomy cavity margins. Other surgeons place different types of clips on the cavity margins. Another method is using the 3-D implant marker, which is sewn to the lumpectomy cavity. Re-excision is facilitated by having the 3-D implant attached to the entire margin cavity, identifying the margin to be re-excised.

The fourth area of concern is the issue of dissection into uninvolved breast tissue with the risk for spreading cancer into unaffected breast tissue. Breast reconstruction involves mobilizing tissue outside of the tumor site and advancing it to the void of the lumpectomy cavity. Surgeons have been taught an oncologic principle to avoid dissection from a "cancer-contaminated" area into a "clean" (noncancerous) area because the potentially contaminated tissue might spread the disease into the clean area. This risk has kept many surgeons away from OPS because of the apparent internal conflict of treatment principles.

Recent studies have resolved that concern with data. The MD Anderson study demonstrated that there was no

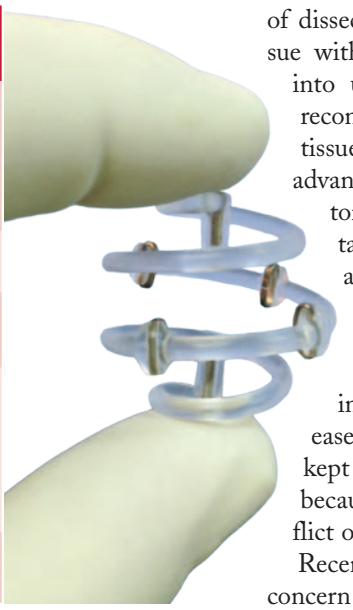
Above left: Surgeons practice their skills with instructor Cary S. Kaufman, MD, during a day-long School of Oncoplastic Surgery anatomy lab. Above right: Oncoplastic surgeon, Gail Lebovic, MD, demonstrates skin markings crucial to obtain optimal results in OPS.

Below: Bioabsorbable 3-D implant marks the lumpectomy cavity.

Table. Overall Survival, Recurrence-Free Survival, Positive/Close Margins, and Seroma or Complication Rates of OPS

Overall Survival	Recurrence-Free Survival	Positive/ Close Margins	Complications/ Seroma Formation
Lumpectomy at 3 y: 95.8%; OPS: 96.8% (P=0.86)[1]	Lumpectomy at 3 y: 96.1%; OPS: 94.6% (P=0.91)[1]	Lumpectomy: 5.8%; OPS: 8.3%, favoring OPS (P=0.04)[1]	Lumpectomy: 13.4%; OPS: 18%, favoring OPS (P<0.002)[1]
95.7% at 5 y[12]	91.6% at 5 y[12]	10.8% (in 2001)[12]	NA
93.4% at 5 y[11]	94% at 5 y[11]	10.8% (9% tumor on ink)[11]	Overall complication rate: 14.3%[11]
NA	97.5% at 39 mo[13]	Lumpectomy margins, 6.1 mm; OPS margins, 14.3 mm, favoring OPS (P<0.0001)[14]	No difference[14]
99% at 26 mo[15]	97.1% at 26 mo[15]	5%[15]	NA

NA, not applicable; **OPS,** oncoplastic surgery



difference in survival or recurrence during the study period 2007-2014 in over 9,800 patients (Table). These studies and others show that OPS can be reliably integrated into the surgical management of breast cancer surgery.

Another positive note in this study was the finding that the positive margin rate was lower when OPS was used. This makes sense because the surgeon not using OPS may feel some hesitation to take wider margins due to the negative effect of large lumpectomy specimens on cosmesis, whereas the surgeon using OPS may take larger specimens because they utilize a method to resolve a large lumpectomy cavity. The OPS surgeon knows that during the reconstruction phase of the surgery, they can rearrange breast tissue to fill the space they just created with their tumor resection. The tissue rearrangement, in turn, will limit the chance for seroma to form because there will be few remaining gaps.[20]

Why and How to Get Started in OPS

With more and more patients requesting and expecting an optimal postoperative appearance, **it should be clear to surgeons that staying relevant in our field soon may include having the OPS skill set.** OPS for breast cancer has been divided into 4 levels according to the extent of skill and training necessary for each of these procedures. Some procedures will be performed only with the joint care of a plastic surgeon, whereas others can be learned by most surgeons and are an extension of existing surgical techniques and approaches (sidebar, page 14).

Of the 4 levels of OPS procedures, level 1 includes many procedures that are simply small variations on procedures that surgeons already perform. Many surgeons learn only level 1 and some level 2 skills, and then involve plastic surgeons for more complex cases of levels 2, 3, and 4.

Although the technical abilities for level 1 procedures may not seem challenging, the correct application of the procedures, planning of the procedures, and calculations of amounts of tissue to rearrange are some of the fine details obtained in courses and lectures. In the past, training for OPS was obtained by unique clerkships and 2- to 6-week (or more) mini-fellowships with experts around the world. Currently, there are more and more courses being offered with varying degrees of training modules. Because of the need for hands-on performance of OPS, the courses with cadaver labs have been most appreciated by "student" surgeons.

Level 1 includes an orientation to the oncoplastic frame of mind, since at its core "oncoplastic surgery is more a way of thinking about breast surgery and breast surgery planning than a group of special methods. "The OPS way of doing things means including aesthetic considerations in breast surgery planning and execution, without dialing back the priority for cancer control in any way," said oncoplastic surgeon Dr. Lebovic, founder of the School of Oncoplastic Surgery.[21]

There are several areas of focus for level 1 training. One area is to understand which patients may benefit from OPS. Cancer patients with larger tumors, larger breasts, and tumors located in the fuller portions of the breast make good candidates since there is neighboring tissue that can be advanced. Tumors located in difficult reconstruction sites of the breast warrant specific training in available OPS techniques for those sites. The lower inner quadrant and upper inner quadrant are both areas to consider specialized techniques to avoid cosmetic deficits. Planning ahead with choice of incision and plans for tissue mobilization are important for these level 1 procedures.

Training in OPS is not as standardized or widely available as it's likely to be in the future, but there are still excellent options for aspiring oncoplastic surgeons today. The American Society of Breast Surgeons (www.breastsurgeons.org), the School of Oncoplastic Surgery (www.oncoplasticmd.com), and the American College of Surgeons (www.facs.org) offer courses that include cadaver or anatomy labs. Hands-on experience is vital for learning any surgical technique and perhaps even more so for aesthetic outcomes.

OPS started outside the United States and is still more prevalent internationally than here. Training opportunities with cadaver or anatomy labs in other countries include the Royal College of Surgeons of England's (www.rcseng.ac.uk) "Specialty Skills in Breast Surgery: Principles in Breast (Level 2)" course.

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One Surgeon's Journey With Oncoplastic Surgery

Anthony Beisler, MD, is a general surgeon who practices in an Ohio town of about 13,000 people. But when it comes to breast cancer surgery, Dr. Beisler doesn't limit his patients to small-town options. Instead, he has begun to offer qualified candidates oncoplastic surgery (OPS).

Anthony Beisler, MD

Dr. Beisler attended medical school at the Ohio State University College of Medicine in the 1990s and did his surgical residency at Dartmouth-Hitchcock Medical Center. Shortly after finishing surgical residency, he entered the military. Over the next four years, he would serve in the wars in Afghanistan and Iraq, mainly as a surgeon on trauma cases. After returning to the United States, he developed a general surgery practice including breast cancer treatment. He first heard about OPS during this period, but there was little imperative to learn it because he rarely had the chance to perform breast procedures. Dr. Beisler now is associated with Mary Rutan Hospital in the town of Bellefontaine, about 40 miles outside Columbus.

While attending medical conferences in his areas of interest, including breast surgery, he heard more about OPS for breast cancer. "It became obvious that if I was going to stay current, oncoplastic surgery was something I would need to incorporate," Dr. Beisler said.

After moving to Bellefontaine, he found that "most women in my town with breast cancer would rather be treated close to home than go to a big academic center in a large city."

As the only surgeon in the area who performed breast surgery, he did many lumpectomies. But the cosmetic outcome of a standard lumpectomy sometimes bothered him.

"Patients could look like they had an ice cream scoop taken out of their breast," he said. That sharpened his resolve to learn OPS so he could provide his patients with more pleasing results.

In 2016, while seeking CME credits, Dr. Beisler took advantage of the opportunity to enroll in his first OPS course. The training was offered by the School of Oncoplastic Surgery (SOS), headed by Gail Lebovic, MD, a pioneer in developing OPS and advancing its use in the United States.

The hands-on components of the course, including an anatomy lab, were crucial for him. "In my little town, I'm it. So I have to learn new methods as deeply as I can, and the only way to do that is with a hands-on course," Dr. Beisler said. He plans to continue his training by repeating the course sometime soon.

"Repetition is the key to learning," he noted. "It's just not realistic to think you're going to absorb everything a course like SOS has to offer in one weekend. There is so much detailed information that is taught, along with multiple techniques."

Dr. Beisler recognized that many initial techniques were applicable soon after the course. He also noted that the higher-level techniques will be useful as his comfort level with OPS improves. ***—C.K.***

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Students are taught both oncoplastic and other reconstructive methods. Hands-on training is also available from the Breast Surgeons of Australia and New Zealand www.breastsurganz.org. The organization provides both level 1 and level 2 courses in OPS. The level 2 course includes a cadaver session.

A Look Ahead

In Part 2 of this article, we will delve more deeply into the different levels of OPS, especially the level 1 and level 2 approaches most often practiced by general surgeons today. We will discuss how to start and maintain relationships with plastic surgeons so you can offer higher levels of OPS to your patients, and we will advise on how to navigate OPS-related issues with hospital credentialing committees. Finally, we'll project how the landscape is likely to change in the future, because one doesn't have to be a fortune teller to see what's coming in this field. That's because OPS is so deeply embedded in breast cancer surgical practice already.

Some innovations come and go without ever making a lasting impact on society, because either they don't actually address something that society needs or something better comes along to replace them. When innovations are true game changers, however, you can see the outlines of the future long before the innovations are widely used.

OPS is one of those game-changing innovations. It is not yet a part of a general surgeon's standard training, but this approach is already so well developed that many women come out of OPS with little significant cosmetic damage. Hopefully, there will be a steady march of general surgeons embracing OPS because they recognize how breast cancer surgery is evolving. If that process doesn't begin on its own, patient demand will propel it. One way or another, OPS will become an ever larger part of breast surgical practice. Additionally, we will have finally emerged from the era when focusing only on cancer control blinded us to larger possibilities.

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Disclosure

Dr. Kaufman reported receiving speaker/consultant fees from the American Society of Breast Surgeons, the School of Oncoplastic Surgery, Focal Therapeutics, Inc, Medical Tactile, Inc, and Sanarus Technologies.