Complications and Difficult Cases

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Below is an excellent article by Dr. Jonathan Ballon. In it, Dr. Ballon gives us his insight and experience as a neurosurgeon and highlights the potentially serious risks of performing hair restoration surgery on patients who were submitted to neurosurgery procedures in the past by describing one case in which the patient faced a major complication. As surgeons dedicated to improving our patient's quality of life, we must always keep in mind that sometimes the potential benefit is not worth the risk for the patient.

On a personal note, I thank Dr. Ballon for his candid comments about my approaches to the cases I have published in this column. Moreover, it is my duty to say—as I did in the articles I wrote—that my protocol for these patients was derived from extensive literature review and an attempt to cover every possible angle to minimize the potential for complications, which always exists.

Finally, I would caution that these types of patients are not ideal for a novice hair transplant surgeon and to the ones unfamiliar with sterile surgical techniques, which may be required for these patients in order to further minimize risks.

I thank Dr. Ballon for his excellent article.

A Neurosurgeon's Perspective on Hair Restoration Surgery

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As perhaps the only representative of my specialty (neurosurgery) among the ISHRS membership, I feel I would be remiss if I did not take a moment to congratulate Dr. Barusco on his thoughtful management of the two challenging cases he presented over the past few months ("Hair Transplantation in a Patient with a Large Cranioplasty," Volume 24, Number 1, pp. 8-11; and "Follicular Unit Transplantation on Irradiated Scalp," Volume 24, Number 4, pp. 134-136). I'd also like to take this opportunity to give a brief overview of the special issues that sometimes need to be considered when evaluating neurosurgical patients for hair restoration surgery, and present a case of my own that illustrates the potential for misfortune.

Cranioplasty is both cosmetic and functional, serving to restore the natural contour of the skull and protect the brain. Dating back nearly 10,000 years to the Neolithic Period, trephination (or trepanation) and cranioplasty are the oldest surgical procedures for which archeological evidence exists.[1] Paintings found in caves suggest that opening the skull was a means of treating a variety of ailments, from headaches to seizures to abnormal behavior.[2] Over the centuries, the materials used to reconstruct the skull have evolved, from precious metals and gourds, to canine bone, to autologous bone, to modern day metals (chiefly titanium mesh and plates), and synthetic materials such as methyl methacrylate, hydroxyapatite, ceramics, and polyetheretherketone (PEEK).[3] Wars have provided the impetus for advances in virtually every surgical specialty, and neurosurgery is no exception.

When considering hair transplantation in a patient harboring foreign material that has been placed either in the skull (e.g., a cranioplasty) or through the skull (e.g., a ventricular shunt or deep brain stimulation system), the physician must be cognizant of the unique risks to which these patients may be exposed. The surgeon's responsibility here is to help the patient make a decision based on what is essentially the very low likelihood of a very troublesome complication. Most patients have no idea whether their neurosurgeon simply replaced their bone flap, or used foreign materials to reconstruct the calvarial defect.[4] Either way, I believe it is incumbent upon the physician to include the patient's neurosurgeon (or at least a neurosurgeon) in the decision-making process so that the patient may be fully informed regarding the potential risks and their implications. Each patient will make his or her own decision about whether or not to proceed with surgery based upon the perceived risk:benefit ratio.

The major concern for a patient with an intracranial foreign body is infection, and the possibility (however remote) that all foreign materials, and perhaps a section of the skull, would need to be removed in order to effectively treat the infection, which could involve bone, brain, and/or cerebrospinal fluid (CSF); in the case of a ventriculoperitoneal (VP) shunt, treatment could also require hospitalization and placement of a temporary ventriculostomy for external drainage of CSF. The closer in proximity the foreign material is to the proposed recipient area, the more likely it is to become infected in the event of post-operative cellulitis or folliculitis. Again, the risk of infection is extremely low (especially if the foreign material is entirely subgaleal, since the galea is generally a formidable barrier to infection), but the stakes are high.[5]

The use of prophylactic antibiotics in clean surgery is controversial.[6,7] With regard to neurosurgical procedures, there is no universally agreed upon drug of choice or protocol for pre-operative antibiotic prophylaxis, even for those patients undergoing VP shunt placement; however, at least a single pre-operative dose is routine for most procedures, and the intravenous route is generally considered to be more effective in reducing the risk of infection.[8] The benefit of oral antibiotic prophylaxis for the hair transplant patient with intracranial foreign material is uncertain, though it would be difficult to argue against it, especially in the absence of intravenous antibiotics. The prevalence of MRSA carriers in the general population has been estimated to be about 2%,[9] which brings into question the need for mupirocin. The most effective aspect of Dr. Barusco's prophylactic protocol may well have been cleansing of the skin with Hibiclens (chlorhexidine).

I was particularly impressed with Dr. Barusco's efforts to transform a "clean" operating environment into a sterile one. Even for those hair transplant surgeons once accustomed to working in sterile operating rooms in the past, it is easy to become forgetful of our aseptic ways. And certainly, most medical

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assistants engaged in hair restoration surgery are unfamiliar with true sterile technique.

The vast majority of patients who undergo external beam radiation (EBRT) for intracranial tumors will not be suitable candidates for hair restoration surgery because of the nature of their underlying disease (most commonly metastatic lesions from a primary tumor elsewhere and glioblastomas) and the poor prognosis for survival; however, as Dr. Barusco pointed out, it is sometimes necessary for patients with benign tumors (typically meningiomas) also to undergo EBRT. In these cases, there are concerns relating to decreased vascularity and tissue turgor, with associated poor wound healing and the possibility of necrosis—to say nothing of poor follicular growth—following hair transplantation. In an effort to optimize his patients' outcome, Dr. Barusco took the appropriate precautions of avoiding the use of epinephrine in the recipient area, as well as making relatively shallow, low-density sites. As we shall see, even when great care is taken to prevent necrosis of the radiated scalp, this can still occur—particularly when the area being addressed is in the mid-scalp, which is more susceptible to ischemia by virtue of its watershed vascular supply.

Stereotactic radiosurgery is increasingly being used to treat intracranial lesions because of the markedly decreased risk of damage to surrounding healthy brain tissue. Likewise, there is little or no associated hair loss, and little or no damage to the scalp, making it much safer for these patients to undergo hair restoration surgery in the event of the more common causes of transplantable of hair loss.

Having experienced a particularly dreadful outcome with a former brain tumor patient of mine, I can assure you that even low-percentage risks do occur. My patient, a 48-year-old nurse, underwent her second craniotomy for a recurrence of her right parasagittal meningioma 10 years later.[10] This time, there was tumor involvement of the overlying skull, thus the bone was discarded and cranioplasty carried out using titanium mesh and methyl methacrylate. In light of the recurrence, the patient underwent a course of post-operative EBRT. She was, understandably, greatly distressed by the resulting large area of hair loss and contacted me after my career change to discuss the possibility of a hair transplant. Her hair in the non-radiated areas of her scalp was "salt and pepper," coarse, and wiry, and her donor density was quite good. With the hubris of a novice, I enthusiastically scheduled the patient for surgery.

I did not go to the lengths that Dr. Barusco did with regard to pre-op antibiotic prophylaxis and rigorous aseptic technique, but 500mg of cephalexin was given an hour before surgery and 8 hours later. The donor and recipient areas were prepped with Betadine. As with Dr. Barusco's patients, "chubby" grafts were prepared and epinephrine was not used in the recipient bed. The shallow, low-density recipient sites were concentrated around the more vascularized periphery of the radiated scalp.

The patient tolerated the procedure well; growth at 1 year was sparse, but she was pleased with the small amount of improvement; unfortunately, I no longer recall how many grafts were transplanted, nor do I have her pre-op and post-op photos. Sufficiently emboldened by my success, a second session was offered to work more centrally in the mid-scalp and add a modest amount of density. The same technical protocol was followed as in the first procedure. Again, I do not have a record of the number of grafts placed in this surgery, but the sites were generously spaced apart. Shortly after the second transplant, the patient developed necrosis in the central recipient area. A plastic surgeon in her home state admitted her to the hospital for excision of the necrotic tissue and closure of the scalp by means of a rotation flap. While hospitalized, the patient developed a MRSA infection; this required removal of all cranioplasty materials and a lengthy in-patient/out-patient course of intravenous antibiotics. At one point, the patient developed intractable seizures followed by a stroke, leaving her essentially non-ambulatory from a left hemiparesis. In spite of a protracted stay in a rehab facility, she was unable to return to her home and has remained in a long-term care facility to this day. Having sold her house and exhausted all of her financial resources, she is now on Medicaid. She decided she had had enough surgery and chose not to undergo delayed repair of her craniotomy defect; thus, she is left with a large, sunken "soft spot" in her scalp through which her right frontal lobe pulsates visibly. (Though I have visited the patient numerous times after the second transplant, I never had the heart—or the stomach—to take any photos.)

Ironically, this woman emerged unscathed—except for her hair loss—from two craniotomies more than 10 years apart for a large, complex and life-threatening tumor, only to meet her downfall as a result of two "simple," elective cosmetic procedures. And the hair for which she has paid such a heavy price? All is gone.

As the numbers of both neurosurgical procedures and hair transplants continue to increase, hair transplant surgeons will encounter more and more prospective patients who have undergone treatment for intracranial pathology. I have spoken with a number of ISHRS members who have successfully performed hair transplants on neurosurgical patients, including those with extensive cranioplasties who have also undergone conventional external beam radiation therapy. While I congratulate them on their achievements, I am nonplussed by the dauntless attitude exhibited by some of my colleagues. It is said that a surgeon's judgment is inevitably tempered by his or her complications. Though it has been 10 years since my patient's surgery, this particular complication haunts me as much as any other in a 34-year surgical career. And it has made me more circumspect with regard to performing a hair transplant on radiated scalp, particularly where there is an underlying cranioplasty. Ultimately, it is important to remember that we are dealing with an elective cosmetic procedure. Our approach should be guided by an understanding of the potential complications, consultation with the patient's neurosurgeon, and the wishes of the patient after he or she has been informed of the possible risks and benefits of the procedure.

References

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3. Sanan, A. Repairing holes in the head: a history of cranioplasty. *Neurosurg.* 1997(Mar); 40(3):588-603.
4. *Author's note:* Technically speaking, even filling in bur holes with acrylic cement or plastic covers could be considered a

cranioplasty of sorts; alternatively, the bone flap might have been secured with titanium plates and screws. Either of these techniques introduces foreign material into the skull and thus it would behoove the hair transplant surgeon to make an effort to consult with the neurosurgeon.

5. *Author's note:* In addition to the risk of a ventriculoperitoneal shunt becoming infected, there is also the possibility of puncturing the shunt valve, reservoir, or tubing.
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9. CDC; 2012 report. "Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network Methicillin-Resistant Staphylococcus Aureus."
10. *Author's note:* The 10-year recurrence rate for all meningiomas is in the range of 10%-15%. Parasagittal meningiomas are more likely to recur due to their intimate involvement with—and frequent invasion of—the superior sagittal sinus, thereby making an attempt at total resection unwise.◆

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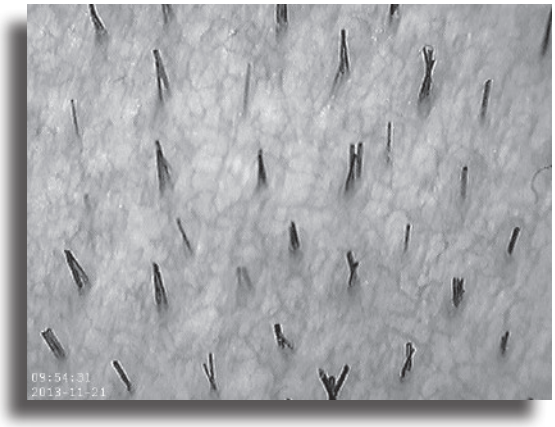

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