# Co-Editors' Messages

## Jerry E. Cooley, MD *Charlotte, North Carolina*

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Where do we go from here? With our ability to densely transplant thousands of finely dissected follicular units, is there really much room for improvement until that day when cloning is here? In fact, I think the answer is yes and that we may be on the verge of a paradigm shift.

Paradigm shifts, according to Thomas Kuhn who coined the term, occur when "normal science" runs into "anomalies" that cannot be explained with the current way of thinking. The anomaly in our current paradigm is the variability in results we see among different patients. Why do some patients get better results if we do the same careful technique from case to case? Some of it, of course, is variability in hair characteristics, but that only explains some of it.

I'm not sure what this change in thinking should be called. Something to the effect of "wound healing and graft optimization." It would cover ideas and innovations such as new graft holding solutions, platelet rich plasma (PRP), hyperbaric oxygen, peri-operative use of low level laser therapy, and topical agents to promote angiogenesis. I'm not saying all of these ideas will ultimately prove useful. But I definitely think some of them will.

The current paradigm is that a structurally intact graft placed into an incision that doesn't stress the blood supply should in fact grow. In this model, grafting is a rather two-dimensional process. Emphasis on quantitative aspects of the process prevail: # of grafts, # of hairs, # of hairs/FU, # of grafts/cm$^2$, etc. The actual process of graft survival is a black box.

The new paradigm will certainly hold high respect for the intact graft and minimally disruptive incisions, but these will be seen as necessary but not sufficient for graft survival. The grafting process is viewed as a dynamic, organic three-dimensional process. Awareness of basic hair research and the surgical literature will inform this new view of hair transplantation. Graft survival will be seen as a small miracle that involves e*x vivo* storage, ischcmia-reperfusion injury, passive oxygen absorption, and ultimately successful angiogenesis. It is patient "micro-variability" in these steps that explains the "macro-variability" in results in my opinion.

In this issue of the *Forum,* the new paradigm comes into our consciousness a little more. Rinaldi describes preliminary results with "Atodinc," an agent that reportedly stimulates angiogenesis. It seems reasonable to me that anything that speeds up and augments the process whereby a new capillary network is established around our grafts would be beneficial.

Joseph Greco, PhD, describes his positive experience coating grafts with PRP as well as placing the gel into recipient sites and the donor area. In a personal communication, Greco told me that he recently saw two patients in whom PRP was used in their transplant 6 months prior. "My first impression was that they looked as though they were at 9 to 10 months rather than 6 months. The transplanted hair appeared more mature, with more aesthetic density than most patients do at that time." Of course, this is anecdotal data but from someone with as much as experience as Joe, I have to put some stock in that.

*jerry Cooley, MD*

## Robert S. Haber, MD *Cleveland, Ohio*

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It has been a busy few months. Two weeks in Europe for the ESHRS and ISHR meetings, with a side trip to Dublin. One week vacationing with my kids. Ten days camping out West. And soon another week in New York City and more camping. More time out of the office for me than I've taken in years, and yet I don't seem at risk of declaring bankruptcy any time soon. How easy it is for us to put our lives outside of medicine on hold for "lack of time," knowing all the while how ever more precious that aspect of our lives becomes with time. I hope all of you have taken enough time for yourselves this summer.

Both the ESHRS meeting in Paris and the ISHR meeting in Milan were successful by any measure, and arc fully covered elsewhere in this issue. Dr. Patrick Frechet organized a thorough didactic program and an incomparable social program that made us feel like royalty. There was also a live surgical program successfully beamed by satellite from Patrick's surgical center to the auditorium. I had the pleasure of demonstrating my Spreader during this program, but learned just before harvesting that my patient had undergone a scalp reduction just a month before. This can alter the vascularity of the donor area, and much to my consternation, the donor harvest was, shall I say, somewhat more sanguinous than desired while cameras were rolling. All turned out well though, and I enjoyed the subsequent opportunity to closely observe Drs. Ron Shapiro and Jerry Wong demonstrate their respective skills.

The ISHR meeting was organized by Dr. Vincenzo Gambino, and was well attended and very informative. The location was elegant, the meals were superb, and the gala dinner was one of the most special evenings ever, particularly for those who stayed until the wee hours.

In between, I visited with Dr. Maurice Collins in Dublin. Still relatively new to our field, he has many years of surgical experience, and has demonstrated himself to be meticulous, skilled, creative, and both gracious and generous. I feel fortunate to be able to consider him a friend.

As always, the recent meetings and office visit managed to bring new ideas into focus, and I've changed my practice yet again, always hoping to tweak my way to an elusive perfection.

As I now enter the crepuscule of my tenure as co-editor of the *Forum,* I begin to reflect on the concepts that have

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# Preliminary Experience and Extended Applications for the Use of Autologous Platelet-Rich Plasma in Hair Transplantation Surgery

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*Joe Greco has indicated no financial interest relevant to this article; Robert Brandt is president of Blood Recovery Systems.*

The use of platelet rich plasma (PRP) in hair restoration surgery reported increased yield when utilized as a graft storage medium (Uebel, 2005).' When grafts arc bathed in activated PRP, there appears to be higher graft survival and quicker healing.

Based on five months of experience involving more than 30 cases, the authors suggest expanding the use of PRP in hair restoration surgery for the following reasons: (1) to enhance donor site wound healing, (2) to decrease the incidence of infection, (3) to reduce donor scarring, (4) to increase donor scar tensile strength, (5) to enhance recipient site healing, and (6) to be utilized as an effective treatment protocol in severe cases of wound dehiscence or infection. In addition to the PRP, platelet poor plasma (PPP) also has potent sealant properties that can be utilized for hemostasis during the procedure.

Platelet-derived growth factor (PDGF) is the evolutionary sentinel growth factor that initiates all wound healing. Platelet rich plasma (PRP) contains several growth factors, including PDGF and transforming growth factor-beta *(TGF-beta* I) at high levels and vascular endothelial growth factor (VEGF).

PDGF's main function is to stimulate cell replication (mitogenesis) of healing capable stem cells. It also stimulates cell replication of endothelial cells. This will cause budding of new capillaries into the wound (angiogenesis), a fundamental part of all wound healing. In addition, PDGF seems to promote the migration of perivascular healing capable cells into a wound and to modulate the effects of other growth factors. Numerous studies and practical applications have also demonstrated how growth factors are essential for regulating the cellular events involved in wound healing by attracting cells to the wound, stimulating proliferation, and significantly influencing matrix deposition (Declair, 1999).[2]

*TGF-beta* is extremely important because it affects most aspects of tissue wound repair, namely initiation and termination, and also promotes differentiation and proliferation (Choi and Fuchs, 1990).[3] PDGF improves dermal regeneration, acts locally to promote protein and collagen synthesis, causes endothelial migration or angiogenesis (Ross, 1987),"4 and induces the expression of *TGF-beta* (Pierce, et al., 1989).[5]

It was further established that wounds treated with PRP gel exhibited not only *enhanced wound repair* compared to control, but *possess more organized collagen* than control tissues, *without excessive deposition of connective tissue or scar formation* (Carter, et al., 2002)." This equine study by Carter, et al. demonstrated biopsy wounds treated with PRP gel to be densely organized, tightly packed fiber bundles parallel to the overlying epidermis suggesting the dense collagen lattice had increased tensile strength in the repaired wound.

The use of PDGF in surgery is widely documented and has become standard intra-operative and post-operative protocol to promote hemostasis, accelerate wound healing, and decrease the incidence of wound infection.

It is therefore suggested that PRP gel is an excellent protocol in hair transplantation for donor wound closures. Preoperativcly, 50cc of blood is drawn from the patient and processed according to the established protocol to create the PRP gel. After the donor strip is harvested, the subcuticular layer is closed with 3.0 Monocryl, activated PRP gel is injected into the wound from end to end (Figure I), and the second layer is approximated with a running 3.0 Prolene suture. After utiliz - ing PRP gel in the donor site, wounds appear to bleed less post-operatively than those not treated with PRP.

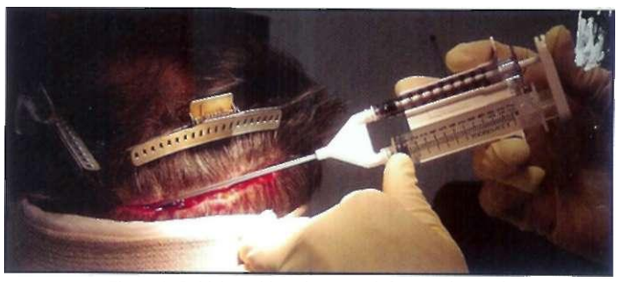

Figure I. Gel injected into the wound, from end to end.

Fear of linear donor scaring is a major concern in our patients today. In our experience, the use of platelet-rich plasma during donor closure results in better healing and less scarring.

After the follicular units are dissected, they arc bathed in activated PRP gel (PRP can be activated with calcium chloride/thrombin or fibrinogen and becomes a gel-like substance) approximately 15 minutes prior to implantation (Figure 2).

figure 2. FUs are bathed in activated PRP gel prior to implantation.

While dissection is ongoing and the graft design pattern is completed, the PRP is then injected into the recipient scalp area after the graft pattern is completed to maximize the multiple effects of growth factors. The PRP provides an en-

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## Platelet-Rich Plasma

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riched environment of concentrated growth factors to accelerate the wound response, thus promoting healing and angiogenesis for the newly implanted follicular units (Figure 3).

Injecting PRP into the recipient area may have other advantages for the non-transplanted hairs because PRP contains several growth factors, including PDGF and VEGF. Takakura, et al. (1996)[7] demonstrated that PDGF signals are involved in both epidermis-follicle interaction and the dermal mesenchyme interaction required for hair canal formation and the growth of dermal mesenchyme, respectively. In 2001, Yano, et al.[8] identified VEGF as a major mediator of hair follicle growth and cycling providing the first direct evidence that the improved follicle vascularization promotes hair growth and increases follicle and hair size.

Figure 3. PRP promotes healing and angiogenesis in newly implanted FUs

This author has observed a more rapid healing after injecting PRP into the recipient site in hair transplantation. Based on the previously mentioned studies regarding the effects growth factors have on hair growth, studies are planned to test the effects PRP and growth factors have on the non-transplanted hair.

In 2003, one of us demonstrated rapid healing and hair regrowth utilizing PRP on a severely traumatized wound in an equine model. While it generally takes nine months for a wound such as this to heal, if the animal survives at all, in this PRP-treated animal, rapid healing of the wound occurred. At one month, complete wound closure and hair regrowth was evident, which never occurs in these cases. Enlarged photos of this case can be seen at the website http://bloodrecovery.com/wound_ba2.htm.[9]

This equine case is a significant example of the extraordinary effects that PRP has on rapid wound repair and hair regrowth in especially difficult cases. It illustrates yet another very valuable use for PRP, especially, in cases of severe infection or wound dehiscence. Rapid use of PRP in this instance cannot only promote healing of the infected wound, but will also promote the regrowth of hair, thus avoiding possible impending scarring traumatic alopecia.

In conclusion, we are seeing encouraging results with these expanded applications for PRP. Further experience will help delineate the role for this exciting technology in our specialty.

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***Editor's note:*** This preliminary information takes the work of Uebel one step further, suggesting that PRP may be of use not only for "basting" grafts but also when injected into recipient sites and in the donor wound. It will be interesting to see if this anecdotal data can be repeated by others and followed with convincing clinical studies. —JC