

Review article:

The benefits of regenerative dermal matrix in tissue reconstruction

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Abstract:

Regenerative tissue matrices provide a superior aesthetic outcome in the vast majority of patients. The use of regenerative tissue matrix uniformly improved qualitative and quantitative measures of symmetry, support, and overall appearance of the reconstructed tissue. Regenerative tissue matrices resulted in subjective aesthetic improvements in nipple projection and appearance when used in primary and secondary nipple reconstructions. Regenerative tissue matrices also provided longer-term maintenance of nipple projection in this context. Superior aesthetic outcomes were also achieved with the use of regenerative tissue matrix to cover anterior rectus fascia defects. A cosmetic advantage was achieved in this context because regenerative tissue matrix resulted in a reduced incidence of unsightly complications such as abdominal wall bulging and herniation. In conclusion, the use of regenerative tissue matrices offers numerous benefits for the surgeon in a variety of settings, resulting in overall enhancement in functional outcome, aesthetic satisfaction, and morbidity profile.

INTRODUCTION

Regenerative tissue matrix is a dermal matrix derived from human cadaver skin that has been processed to remove cells and antigenic material. What remains is a dermal matrix consisting of extracellular matrix components. When placed in contact with living tissue, the matrix becomes repopulated with circulating stem cells that differentiate into the various cellular subtypes. Regenerative tissue matrix is rapidly gaining acceptance in tissue reconstruction because of several benefits. These include reports that regenerative tissue matrix limits post-operative morbidity, improves skin flexibility, and allows more rapid post-operative recovery. The potential of regenerative tissue matrix to limit postoperative morbidity stems from the fact that the material allows the surgeon to avoid using underlying muscle and fascia for reconstruction. Use of the underlying

muscle and fascia is associated with increased pain and morbidity for the patient. Regenerative tissue matrix functions as an extension of the underlying musculature, creating a scaffold for the body's natural regenerative mechanism.

REGENERATIVE TISSUE MATRICES PROVIDE SUPERIOR FUNCTIONAL AND AESTHETIC OUTCOMES

The positive benefits of regenerative tissue matrix in the setting of wound reconstruction are well-established. The use of regenerative tissue matrix demonstrates superior outcomes in maintaining the shape and symmetry of the surrounding tissue. Regenerative tissue matrices offer greater circumferential support about the wound area, resulting in a superior aesthetic outcome. Regenerative tissue matrices can be transformed by surgeons into a workable mesh material which retains

its tensile strength, allowing improved reconstruction outcomes both functionally and aesthetically. For patients with autologous tissue of insufficient quality or quantity to complete the reconstruction, the best method is to utilize regenerative tissue matrices as an adjunct to the patient's own tissues in a graded fashion. In order to maximize circumferential dermal support during a reconstruction procedure, regenerative tissue matrices can be used complementarily to the patient's own tissues to improve functional and aesthetic outcomes. (1)

Regenerative tissue matrices may also be effective for tissue reconstruction in patients with a history of radiation therapy. Several studies have analyzed the functional and aesthetic outcome associated with the use of regenerative tissue matrices in irradiated skin surfaces, paying particular attention to the parameters of skin elasticity, compressibility, postoperative morbidity, and healing time. Uniformly, regenerative tissue matrices showed positive outcomes when used in this patient population. This was felt to be because regenerative tissue matrices effectively eliminated the need to use autologous sources of tissue for reconstruction. Moreover, patients reported reduced postoperative discomfort and improved aesthetic satisfaction when regenerative tissue matrices were used. (1)

REGENERATIVE TISSUE MATRICES IN BREAST RECONSTRUCTION

In one case series, the use of regenerative tissue matrix to control positioning of the breast implant in 43 patients (67 breasts) who underwent immediate, delayed and revision breast reconstruction yielded positive results. Regenerative tissue matrix allowed for complete coverage and symmetric positioning of the implant when used in place of the serratus anterior muscle to form the expander pocket. This

ensured an appropriate aesthetic outcome in addition to a reduction in postoperative morbidity. The study indicated an extremely low rate of complications associated with the use of regenerative tissue matrix: no capsular contracture (a complication more frequent when using a solely autologous approach), hematoma, or seroma were observed in any of the 43 patients in 6 months to 3 years of follow up. These are unprecedented results for any case series of this size, and they reflect the beneficial clinical profile of regenerative tissue matrix in this setting. (2)

Another study involving the reconstruction of 30 breasts in 24 patients immediately post mastectomy concluded that regenerative tissue matrices reduce the incidence of the common postoperative complications of rippling and symmastia. The use of regenerative tissue matrix resulted in an optimal aesthetic result by allowing for thicker muscle coverage and stronger inferior-pole support of the implants. These two key structural benefits of regenerative tissue matrix address many of the aesthetic disadvantages of traditional implant reconstruction and reflect the optimal aesthetic outcomes associated with regenerative tissue matrices in this clinical setting. In a separate retrospective study of 65 patients in whom regenerative tissue matrix was used, the complication rates for wound infection, hematoma, and seroma were examined and found to be extremely low. (3-4)

REGENERATIVE TISSUE MATRIX TO CLOSE DEFECTS IN THE ANTERIOR RECTUS FASCIA

The use of regenerative tissue matrices to close defects in the anterior rectus fascia has been suggested in order to reduce the appearance of hernias and abdominal wall bulging. In one landmark case series, 54 consecutive patients undergoing

closure of defects in the anterior rectus fascia were surgically repaired with regenerative tissue matrix placed as an inlay graft. The common postoperative complications of hernia or infection did not occur in any of the patients. Biopsy of the regenerative tissue matrix graft 12-14 months postoperatively showed full tissue integration with cell density, vasculature, and collagen orientation in the biopsies consistent with abdominal fascia tissue. The surgeons concluded that regenerative tissue matrix should be recommended as an 'alternative option for abdominal fascia closure.' (5-6)

REGENERATIVE TISSUE MATRIX FOR BREAST RECONSTRUCTION IN HIGHER RISK PATIENTS

Additional studies have shown the benefits of regenerative tissue matrix for breast reconstruction in higher-risk patients. One study followed 49 patients for up to 52 months (mean 18 months, range 3-52 months). All 49 patients subjectively reported decreased postsurgical pain when measured by quantitative pain assessment score. This was attributed to decreased muscle elevation and intact maintenance of the serratus anterior muscle. Both surgeon and patients were satisfied with breast projection and symmetry. There were no serious postoperative complications in any of the patients. None of these patients developed infections, and all had optimal cosmetic outcomes. (7)

The use of regenerative tissue matrix has also been evaluated in high-risk patients undergoing breast reconstruction. In one prospective study, 13 breast reconstructions were completed in 11 patients averaging 58 years of age with a mean postoperative follow-up time of 13 months. 90% of these patients were considered high risk candidates with 3 or more systemic comorbidities. The use of regenerative

tissue matrices provided greater stability, enhanced soft tissue healing, greater resemblance to a normal breast shape, decreased rippling, and decreased implant visibility. Several patients with a history of prior radiation therapy also healed without complications. (8)

REGENERATIVE TISSUE MATRIX ENHANCES LONG-TERM TISSUE PROJECTION

Regenerative tissue matrix improves long-term nipple projection after nipple reconstruction. In one case series, nipple reconstructions using a modified star dermal flap pattern with a regenerative tissue matrix core as the central strut were performed. Long-term maintenance of nipple projection was significantly improved when regenerative tissue matrix was used, reflecting a major improvement in a key clinical parameter. No infections or complications were seen in the patients for whom regenerative tissue matrix was used. (9)

SUBJECTIVE EXPERIENCE AND AESTHETIC OUTCOMES

Studies have shown that the use of regenerative dermal matrix in tissue reconstruction is associated with a marked reduction in postoperative pain and morbidity as measured by a quantitative pain scale. These studies also reflect enhancement in recovery times, faster return to work, and improved performance of activities of daily living. With quantitative declines in postoperative pain and enhancement in recovery times, there is no question that the use of regenerative tissue matrix results in an enhanced recovery experience for the patient. Furthermore, multiple studies demonstrated a reduced occurrence of common postoperative complications such as seroma formation or infection associated with the surgical use of regenerative tissue

matrix. (1-9)

CONCLUSION

Regenerative tissue matrices provide a superior aesthetic outcome in the vast majority of patients. The use of regenerative tissue matrix uniformly improved qualitative and quantitative measures of symmetry, support, and overall appearance of the reconstructed tissue. Regenerative tissue matrices resulted in subjective aesthetic improvements in nipple projection and appearance when used in primary and secondary nipple reconstructions. Regenerative tissue matrices also provided longer-

term maintenance of nipple projection in this context. Superior aesthetic outcomes were also achieved with the use of regenerative tissue matrix to cover anterior rectus fascia defects. A cosmetic advantage was achieved in this context because regenerative tissue matrix resulted in a reduced incidence of unsightly complications such as abdominal wall bulging and herniation. In conclusion, the use of regenerative tissue matrices offers numerous benefits for the surgeon in a variety of settings, resulting in overall enhancement in functional outcome, aesthetic satisfaction, and morbidity profile.

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