Flowable Placental Tissue Matrix as Adjunct for Surgical Wound Healing in Anterior Ankle Procedures

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Statement of Purpose

A common complication of anterior ankle surgery is dehiscence of the anterior skin incision. Human amniotic membrane is currently available as a graft and injection in reconstructive foot and ankle surgery. Placental tissue is used to minimize inflammation and scar tissue formation. Therefore, it was hypothesized that adjunctive use of injectable placental tissue would reduce potential wound complications.

Methodology

A retrospective chart review was performed of the primary surgeon. Charts and clinical photographs were reviewed to assess outcomes. Fifty one patients underwent an anterior ankle procedure over a twenty-six month period. The anterior ankle procedures included total ankle replacement arthroplasty (TAA), anterior ankle arthrodesis, arthrotomy, open reduction internal fixation ankle/pilon fractures (only those with anterior approach), primary anterior ankle laceration repair and hardware removal. Patients were evaluated preoperatively for primary pathology, pain, function, radiographic findings and physical exam findings. Physical exam included open wounds, previous surgical incisions, presence of keloids or hypertrophic scars. Procedures performed by single surgeon in standard technique. Placental tissue was injected into the subdermal space immediately after skin closure. Assessment of incision was noted at 3, 6 and 10-12 weeks post-operatively. A complication was defined as superficial versus deep infection, and a dehiscence requiring return to the OR.

Procedure

Absorbable suture was used to re-approximate the periosteum and capsular tissue in an interrupted fashion. If exposed, the TA and EHL tendons were closed in their respective sheaths, along with the deep fascia and retinaculum. The subcutaneous layer was closed in an interrupted fashion. Non-absorbable suture was used for skin in an Allgower-Donati or horizontal mattress technique. Injectable placental tissue matrix was inserted into the anterior incision site after skin closure utilizing a 22 gauge needle. The patient was placed in a modified Jones compressive dressing and posterior splint, non weight bearing. Patients were evaluated one week after surgery for an incisional wound check and reapplication of posterior splint. At three weeks, the sutures were removed, steri-strips applied and patient was placed in a walking boot. The patient also started gentle home ankle range of motion exercises.

Literature Review

Surgeons are focusing their efforts on reducing complications through surgeon technique and the use of adjunctive orthobiologics. It is well documented that the anterior incisional approach is high risk for surgical wound dehiscence, ranging as high as 25% to 34% (1). This is thought to be related to its location overlying the extensor tendons, rough tissue handling, and undue soft tissue stress. In response, surgeons make a point of minimizing retraction and handling of surgical wound margins, reducing electrocautery usage near skin edges, and modifying the method of suturing utilized during wound closure. The Allgower-Donati suture pattern has been shown to have the least amount of effect on cutaneous blood flow with increasing tension (2). Furthermore, sutures tend to remain in place longer for anterior ankle incisions and care is taken to prevent excess anterior ankle pressure with the surgical dressing and splint (3).

Human amniotic tissue and umbilical cord has been extensively studied and used in various medical and surgical specialties, including burn treatments, wound care, ophthalmology, and orthopedic surgery (4-8). Human amniotic membrane makes up the innermost layer of the placenta and extends to create the outer most layer of the umbilical cord. These tissues are rich in high molecular weight hyaluronic acid proteoglycan complex, which has been demonstrated to play a vital role in tissue morphogenesis, healing, anti-inflammatory, anti-scarring, and anti-adhesive properties (11-14).

Results

Of 51 patients, 92.2% achieved complete incisional closure at 3 weeks, 96.1% at 6 weeks, and 100% by 10-12 weeks. Two wound complications (3.92%) were noted, both achieved complete healing. There were no deep infections and one superficial infection that did not require surgical intervention.

Table 1

Post op week	Patients (51)	Incisional closure %	Complication type	Complication %	Treatment
3	47	92.2%	1: superficial dehiscence	1.96%	Wound care (wc)
			1: superficial infx	1.96%	WC + Bactrim DS
			2: deep dehiscence	3.92%	Wound care
6	49	96.1%	2: deep (no infx)	3.92%	OR: graft
10-12	51	100%	0		Healed

Figure 1

(A) Intra op deep closure
(B) Subq tissue closure
(C) Skin closure, app of placental tissue matrix
(D) 1 wek post op
(E) 6 weeks post op

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Analysis & Discussion

With recent advances in orthobiologics, surgeons are on the constant look-out for new ways to help reduce postoperative complications. Amniotic tissue has been used as wound adjuncts for chronic dermal ulcers or defects to promote granulation tissue and rapid re-epithelialization (6). Amniotic membrane has been shown to have superior tendonization and anti-adhesive properties (13-14). This retrospective review demonstrates the use of injectable placental tissue matrix. The technique to inject the amniotic tissue after skin closure is quick, efficient and reproducible. Appropriate soft tissue handling, careful retraction, layered closure, and off loading dressings are important considerations to aid in skin tension reduction (3). In this review, it is noted that the postoperative soft tissues have less pain and edema, minimal incisional scar, no deep infections, or deep wound dehiscence exposing hardware or bone.

The reduction in edema and minimal incisional scar, is hypothesized to correlate with tissue handling techniques and anti-inflammatory properties of the placental tissue matrix. Less soft tissue swelling leads to less tension on the incision, leading to a reduction in pain and dehiscence rates. A decrease in wound dehiscence, results in reduction of infection. If there is a superficial wound dehiscence, layered closure helps protect the underlying deeper tissues and hardware from a possible deep infection complication. In this series, the overall wound complication rate was 3.92% and overall infection rate was 1.96%, which are low when compared to literature. Because of this, flowable placental tissue matrix is a viable consideration for inclusion on anterior ankle procedures to maintain low wound complication rates.

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