PriMatrix®
Dermal Repair Scaffold

CLINICAL EVIDENCE
**PriMatrix**, derived from fetal bovine dermis, is a unique dermal repair scaffold for the management of challenging wounds. The proprietary technology used to process PriMatrix products preserves the beneficial properties of the natural fetal collagen fibers, and generates an acellular dermal tissue matrix free of contaminants and artificial chemical crosslinks. The scientific foundation for PriMatrix is well-documented and has been discussed at length in multiple scientific articles that highlight the differentiating characteristics of PriMatrix (Rennert 2013, Cornwell 2009, and Landsman 2009). This scaffold has been identified for its superior biocompatibility as well as its ability to trap and bind the patient’s own cells\(^1\)\(^2\) and growth factors\(^3\) within the matrix at the time of surgery. The enriched dermal collagen fibers support cellular repopulation and revascularization processes critical in wound healing.

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In over a decade of use, PriMatrix has demonstrated clinical success in the management of a wide range of skin wounds.

• Studies performed at centers around the country clearly define the clinical and cost-effectiveness of PriMatrix in chronic wound care, as well as trauma and surgical skin reconstructions (Hayn 2013, Karr 2011, Kavros 2012, Lullove 2012, Neill 2012, Strauss 2012). Recently, a prospective multicenter study across 9 centers has been published demonstrating the use of PriMatrix in the management of diabetic foot ulcers. Of the 55 patients completing the study, 76% achieved closure of their diabetic foot ulcer by 12 weeks (Kavros 2014). The average healing times for these chronic diabetic ulcers managed with PriMatrix was 53.1 days with an average of 2 applications. Individual centers have reported similar healing results on the use of PriMatrix in diabetic foot ulcers, venous and pressure ulcers, and other chronic wounds (Lullove 2012, Strauss 2012, Karr 2011, Kavros 2012).

• In particularly complicated full thickness wounds with exposed tendon and bone, skin grafts and living skin substitutes are not indicated. Published clinical studies have reported on the clinical effectiveness of PriMatrix in managing such challenging wounds (Hayn 2013, Lullove 2012, Neill 2012, Strauss 2012). The implantation of PriMatrix was found to facilitate the formation of vascularized tissue over tendon and bone. Definitive closure was achieved either by re-epithelialization from the wound margins or successful take of a split-thickness skin graft. Additional published studies have reported similar successful outcomes with PriMatrix in full thickness wounds resulting from trauma, scar revision, Charcot neuropathy, cancer resection, and necrotizing fasciitis (Dunckel 2009, Hayn 2013, Higgs 2010A, Higgs 2010B, Kavros 2012, Kosutic 2012, Lullove 2012, Neill 2012, Neill 2013, Strauss 2012, Wanitphakdeedecha 2008).
Diabetic Foot Ulcers

Karr J. Retrospective comparison of diabetic foot ulcer and venous stasis ulcer healing outcome between a dermal repair scaffold (PriMatrix) and a bilayered living cell therapy (Apligraf®). Adv Skin Wound Care. 21: 270-4, 2011

- Diabetic ulcers that had less than 1 mm² healing in 4 weeks were treated with PriMatrix or Apligraf.
- PriMatrix managed diabetic foot ulcers healed in an average of 37 days, while diabetic foot ulcers treated with Apligraf healed in an average of 87 days.
- When directly compared with Apligraf, PriMatrix was found more cost effective for diabetic foot ulcers by matching available product sizes and configurations to managed ulcers.


- Prospective multicenter study lead by the Mayo Clinic (Rochester, MN) reporting 76% healing by 12 weeks for diabetic foot ulcers managed with PriMatrix within the Completed Treatment Subset.
- Average time to heal was 7.5 weeks with an average of 2.1 applications of PriMatrix.
- Of non-healing wounds, wound area was reduced by 71% on average at 12 weeks.


- All patients had chronic non-healing ulcerations associated with Charcot Neuroarthropathy.
- A statistically significantly faster rate of healing was observed in the PriMatrix group (87.9 mm³/week) compared with the control standard of care group (59.0 mm³/week).
- Mean time-to-healing in the PriMatrix group (116 days) was statistically significantly shorter than in the control standard of care group (180 days).


- 81.8% of diabetic foot ulcers had exposed bone and 63.6% were previously infected.
- Mean healing time was 105±92 days with an average of 2.6 PriMatrix applications.
- Successful wound closure was achieved despite complicating patient factors, including advanced age, obesity, diabetes, PVD/VI, neuropathy, and concomitant use of anticoagulants.


- Recalcitrant ulcers previously unresponsive to skin substitutes were successfully managed with PriMatrix.
- 50% of diabetic foot ulcers had exposed tendon/bone.
- 50% of diabetic foot ulcers healed with PriMatrix management, despite complications of exposed tendon/bone and/or previous wound infection.
**Venous Leg Ulcers**

Karr J. Retrospective comparison of diabetic foot ulcer and venous stasis ulcer healing outcome between a dermal repair scaffold (PriMatrix) and a bilayered living cell therapy (Apligraf). Adv Skin Wound Care. 21: 270-4, 2011

- Venous leg ulcers that had less than 1 mm² healing in 3 weeks were treated with PriMatrix or Apligraf.
- PriMatrix managed venous leg ulcers healed in an average of 32 days while venous leg ulcers treated with Apligraf healed in an average of 63 days.
- When directly compared with Apligraf, PriMatrix was found more cost effective for venous leg ulcers by matching available product sizes and configurations to managed ulcers.


- Mean venous leg ulcer area was 12.5 cm² with ulcers as large as 63 cm².
- Complex venous leg ulcers healed in a mean of 82 days with an average of 1.4 PriMatrix applications.

**Full Thickness Wounds with or without Exposed Bone and/or Exposed Tendon**


- A 101 day old wound jeopardizing limb preservation from a complex crush injury/partial amputation of right hand was managed with PriMatrix.
- Seventeen days post placement the wound was fully re-epithelialized with maximum functional use.


- 50% of traumatic and surgical wounds had exposed tendon and/or bone.
- Complete wound healing was documented in over 80% of the wounds, whether the wound was managed with PriMatrix alone or PriMatrix supplemented with negative pressure wound therapy (NPWT).
- The implantation of PriMatrix was found to facilitate the formation of vascularized tissue over tendon and bone. Definitive closure was achieved either by re-epithelialization from the wound margins or successful take of a split-thickness skin graft.

Higgs WR. Repair of a fifth finger crush injury. Wound Care and Hyperbaric Medicine. 1: 9, 2010A

- PriMatrix was used to manage a degloving injury to fifth finger of the left hand that had been recommended for amputation at the proximal joint.
- PriMatrix coupled with hyperbaric oxygen therapy was used to completely heal finger with full range of motion.
Higgs WR. Necrotizing fasciitis with delayed closure. Wound Care and Hyperbaric Medicine. 1: 8, 2010

- A 966 cm² full thickness wound resulting from aggressive debridement of synergistic cellulitis with necrotizing fasciitis was managed concurrently with negative pressure wound therapy and PriMatrix.
- The use of PriMatrix and negative pressure wound therapy to build up the wound bed assisted in building viable dermal-like tissue. The implantation of PriMatrix was found to facilitate the formation of vascularized tissue. Definitive closure was achieved by successful take of a split-thickness skin graft.


- PriMatrix was used to cover posterior and anterior tibialis turn-over muscle flaps to manage a degloving injury to the right-lower leg.
- Successful integration of PriMatrix into completely viable muscles was noted after a week. The implantation of PriMatrix was found to facilitate the formation of vascularized tissue. Definitive closure was achieved by successful take of a split-thickness skin graft.


- 44% of all wounds (varying etiologies) had exposed tendon/bone with many patients strong candidates for amputation.
- All wounds healed in 10 to 15 weeks.


- PriMatrix was used to reconstruct full thickness wounds by generating a new dermal-like tissue. The implantation of PriMatrix was found to facilitate the formation of vascularized tissue. Definitive closure was achieved by successful take of a split-thickness skin graft.
- Histology confirmed PriMatrix was repopulated by patient cells and supporting vasculature in a manner to generate new structures in the wound that were morphologically similar to dermal tissue.


- Histological analysis was performed of full-thickness skin wounds (varying etiologies) managed with PriMatrix.
- PriMatrix was repopulated by fibroblasts and supporting vasculature to generate a dermal-like tissue.
- The generation of dermal-like tissue in the wound decreased granulation tissue deposition, which may lead to improved functional and aesthetic healing outcomes.


- 45% of all wounds evaluated had tendon/bone exposure.
- 80.8% of the tendon/bone exposed wounds healed.
- PriMatrix was used as part of an effective treatment regimen to manage complex wounds with exposed tendon/bone caused by varying etiologies.
# Summary of Selected Published Clinical Data on PriMatrix

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Study Summary</th>
<th>Total # of Wounds Evaluated</th>
<th>Chronic Ulcers</th>
<th>Trauma/ Surgical Wounds</th>
<th>Tendon/ Bone Exposure</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kavros et al.</td>
<td>2014</td>
<td>Multi-center prospective evaluation of PriMatrix in chronic diabetic foot ulcers.</td>
<td>55</td>
<td>✓</td>
<td></td>
<td></td>
<td>Of the 55 patients completing the study, 76% achieved closure of their diabetic foot ulcer by 12 weeks.</td>
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<tr>
<td>Hayn</td>
<td>2013</td>
<td>Single center retrospective evaluation of complex surgical and traumatic wounds. PriMatrix was utilized to avoid skin flaps and healing outcomes using PriMatrix and PriMatrix + NPWT were compared.</td>
<td>43</td>
<td></td>
<td>✓ ✓ ✓</td>
<td></td>
<td>Complete wound closure was documented in over 80% of all wounds managed including those with tendon and/or bone exposure in both PriMatrix and PriMatrix + NPWT treatment groups.</td>
</tr>
<tr>
<td>Strauss et al.</td>
<td>2012</td>
<td>Retrospective study from a two physician practice evaluating the outcomes of PriMatrix in managing chronic ulcers and acute wounds within a complex subject population.</td>
<td>58</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓ ✓</td>
<td></td>
<td>75.9% of the wounds managed with PriMatrix successfully healed.</td>
</tr>
<tr>
<td>Kavros</td>
<td>2012</td>
<td>Single center retrospective comparative study evaluating the healing outcomes of ulcerations of the midfoot associated with Charcot neuroarthropathy when managed with PriMatrix or standard of care therapy.</td>
<td>20</td>
<td>✓</td>
<td></td>
<td></td>
<td>A significantly faster rate of healing was observed in the PriMatrix managed wounds in comparison to the wounds managed with standard of care. Mean time to healing for the PriMatrix group was 116 days and 180 days for the standard of care group.</td>
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<tr>
<td>Lullove</td>
<td>2012</td>
<td>Single center retrospective study evaluating wounds managed with PriMatrix that were previously unresponsive to conservative therapy within a subject population having comorbidities known to delay wound healing.</td>
<td>34</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓ ✓</td>
<td></td>
<td>88.2% of all wounds healed with a mean time of healing ranging from 74 to 105 days based on wound etiology.</td>
</tr>
<tr>
<td>Neill et al.</td>
<td>2012</td>
<td>Histological evaluation of assimilation of PriMatrix in full thickness wounds and correlation with skin graft take and outcomes.</td>
<td>7</td>
<td></td>
<td>✓ ✓ ✓</td>
<td></td>
<td>Wounds managed with PriMatrix achieved successful skin grafting as early as 7 days. Subjects undergoing scar revision procedures had improved functionality at long-term follow-up visits.</td>
</tr>
<tr>
<td>Karr</td>
<td>2011</td>
<td>Retrospective analysis of healing results for subject matched diabetic and venous ulcers managed with PriMatrix or Apligraf.</td>
<td>68</td>
<td>✓</td>
<td></td>
<td></td>
<td>PriMatrix managed DFUs healed in an average of 37 days, while DFUs treated with Apligraf healed in an average of 87 days. PriMatrix managed VLUs healed in an average of 32 days while VLUs treated with Apligraf healed in an average of 63 days. PriMatrix was found to be more cost-effective when considering healing times, ability to match product size to wound size, simpler storage, and longer shelf-life.</td>
</tr>
</tbody>
</table>
References


Hayn, E. Successful Treatment of Complex Traumatic and Surgical Wounds with a Fetal Bovine Dermal Matrix. Int Wound J, 1: 9, 2010A

Higgs WR. Repair of a fifth finger crush injury. Wound Care and Hyperbaric Medicine. 1: 8, 2010B

Higgs WR. Necrotizing fasciitis with delayed closure. Wound Care and Hyperbaric Medicine. 1: 9, 2010A

Karr J. Retrospective comparison of diabetic foot ulcer and venous stasis ulcer healing outcome between a dermal repair scaffold (PriMatrix) and a bilayered living cell therapy (Apigraf). Adv Skin Wound Care. 21: 270-4, 2011


Indications
- PriMatrix® is intended for the management of wounds that include partial and full thickness wounds; pressure, diabetic, and venous ulcers; second-degree burns; surgical wounds - donor sites/grafts, post-Moh’s surgery, post-laser surgery, podiatric, and wound dehiscence; trauma wounds - abrasions, lacerations, and skin tears; tunneled/undermined wounds; draining wounds.

Contraindications
- PriMatrix should not be used for patients with a known history of hypersensitivity to collagen or bovine products.

Warnings and Precautions
- Do not expose to chemicals or substances other than sterile, room temperature 0.9% saline.
- Excessive heat can damage collagen. Do not hydrate in 0.9% saline warmed above room temperature. If, when hydrated, the product shrinks in size, DO NOT use the product as it may be damaged.
- PriMatrix should be used with caution in regions where an infection exists or is suspected. Treat any existing infection appropriately.
- PriMatrix should not be applied directly on third degree burns.

Potential Complications
The following complications are possible. If any of these conditions occur, the device should be removed.
- Infection
- Chronic inflammation
- Allergic reaction
- Excessive redness, pain, swelling, or blistering

Availability of these products might vary from a given country or region to another, as a result of specific local regulatory approval or clearance requirements for sale in such country or region.

Non contractual document. The manufacturer reserves the right, without prior notice, to modify the products in order to improve their quality.

Warning: Applicable laws restrict these products to sale by or on the order of a physician.

Consult product labels and inserts for any indication, contraindications, hazards, warnings, precautions, and instructions for use.