Peripheral Nerve Reconstruction Using Placental Connective Tissue Matrix to Alleviate Phantom Limb Pain

UNIVERSITY of MARYLAND SCHOOL OF MEDICINE

Department of Vascular Surgery

Nora Dunlap ACNP, Suzanna Fitzpatrick ACNP, Khanjan Nagarsheth MD

Introduction:

Phantom limb pain (PLP) complicates approximately 85% of patients who undergo major amputation. This can affect:

- Mobility
- Impair activities of daily living
- Impact overall quality of life (QOL)

The pain itself can be debilitating, causing patients to rely on medication to dull the pain which adds to the decreased QOL

Surgical treatments to help treat PLP have been described and offer promising results. Placental connective tissue matrix (PCTM) has been shown to help wound healing and nerve repairs in multiple studies[1]. Herein, we describe the use of PCTM with peripheral nerve reconstruction (PNR) for the treatment of PLP.

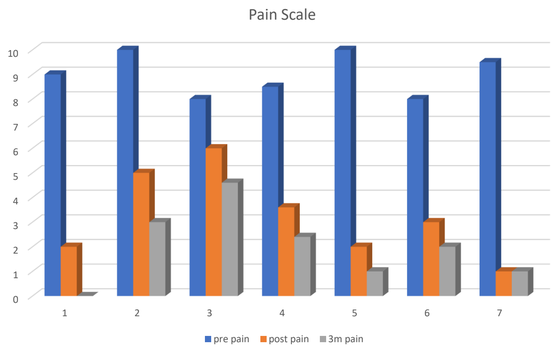
Methods:

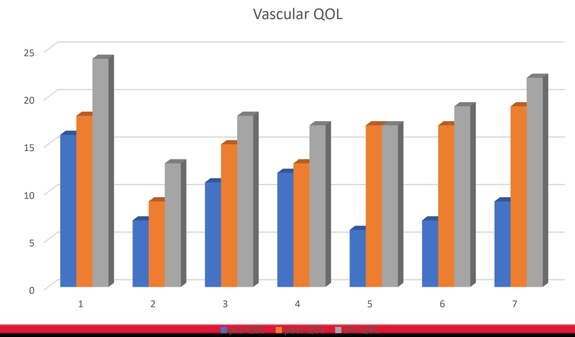
Retrospective chart review identified seven patients over a six-month time frame in 2022, who underwent PNR. This reconstruction included targeted muscle reinnervation (TMR) and PNR for chronic and debilitating PLP. Patient charts were reviewed for:

- Demographics
- Risk factors
- Pre and post reported pain scale
- Pre and post pain intensity
- Pre and post vascular QOL scores
- Current functional status.

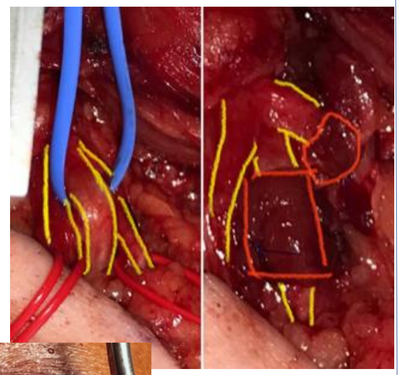
Results :

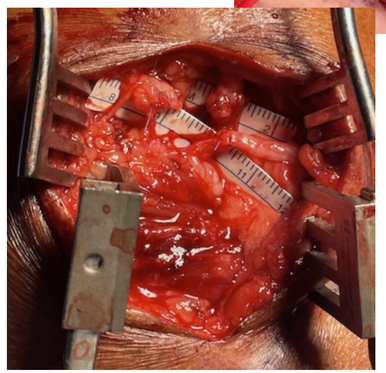
All the patients (7/7, 100%) were male with below knee amputations (BKA). The mean age of these patient was 56.2 years (range 31-76 years). Cardiovascular disease was present in 28% (2/7) of patients, hypertension 71% (5/7), diabetes 42% (3/7), and peripheral arterial disease 42% (3/7). Two patients had no significant medical history other than trauma to the limb, while the other amputations were due to non-healing wound 71% (5/7).





Prior to PNR, each patient had undergone nerve block which relieved their PLP. Preoperative pain scores were assessed via a validated quality of life survey on a scale of 1 to 10 averaged 9 (range 8-10), pain intensity reported severe (very severe to moderate), and vascular QOL-6 score averaged 9.7 (range 6-16). After PNR utilizing PCTM around the reconstruction, post-operative pain scores averaged 3.2 (range 1-6), pain intensity mild to moderate, and vascular QOL-6 score 16 (range 22-9).

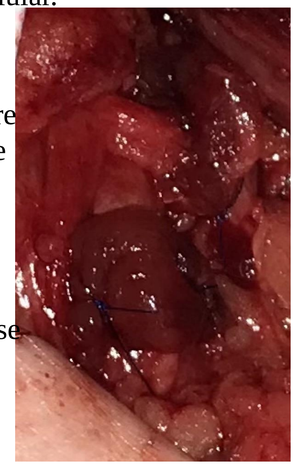




Discussion:

Amnioexcel is a placental connective tissue matrix with intact extracellular matrix that promotes angiogenesis, reduce scar tissue formation, modulate inflammation and pain, in addition to the possible anti-microbial effects and has shown to prevent inherent growth factors, cytokines and extracellular.[2]

During the RPNI, the sural, tibial, and peroneal nerves were identified and attached into the gastrocnemius motor nerve to provide neuromuscular targets for these nerves which cause PLP. Amnioexcel was cut into strips and wrapped around these nerve collections.



Conclusion:

Phantom limb pain can negatively affect patient's well-being, functioning, activity, overall quality of life. Though medical management is first line therapy, it carries significant risks in a comorbid population. For patients with PLP, PNR with PCTM can help alleviate their pain, decrease pain medication use, and improve their quality of life.

References:

1 Moore, C., Bonvallet, P., Damaraju, M., Modi, N., Gandhi, A., & McFetridge, S. (2020). Biological characterization of dehydrated amniotic membrane allograft: Mechanisms of action and implications for wound care. *Journal of Biomedical Materials Research Part B: Applied Biomaterials*, *108*(8), 3076-3083.

2. Roy, A., Mantay, M., Brannan, C., & Griffiths, S. (2022). Placental Tissues as Biomaterials in Regenerative Medicine. *BioMed Research International*, *2022*.