Peripheral nerve injuries occur in 2.8% of trauma patients. [1] Approximately 100,000 patients undergo peripheral nerve surgery in the United States and Europe each year. [2] Nerve autografts are considered the gold standard in peripheral nerve gap regeneration; however, its disadvantages, such as neuroma formation, scarring, limited availability and prolonged surgery durations, present the need for an alternative method of treatment. [3,4] In recent years, both biological and artificial conduits have become of particular interest as an alternative therapy for peripheral nerve injuries. Nerve allografts offer an unrestricted source of nerve epineurium, which can be utilized as a bridging conduit between the two nerve stumps to support nerve recovery. The epineurium is a layer of connective tissue surrounding the nerve, constituting its anatomical border. Its acellular properties make it non-immunogenic, which is an important trait, especially compared to traditional nerve allograft which require systemic immunosuppression. The neural origin is the potential advantage of this conduit over other biological tubes. High laminin B2 and VEGF expression provides a highly neuropermissive environment for Schwann cell attachment and axonal ingrowth. [3] Mesenchymal stem cells, due to their anti-inflammatory and neuroregenerative properties are considered a promising approach as a novel therapeutic approach for enhancement of nerve regeneration – the human epineural conduit (hEC) consisting of human epineural sheath (hES) supported with human mesenchymal stem cells (hMSC). OBJECTIVE

To test the effect of human Epineural Sheath Conduit (hEC) supported with human Mesenchymal Stem Cells (hMSC) on the restoration of 20mm long nerve defect in a nude rat model.

RESULTS

> We confirmed the feasibility of hEC creation and its successful application in repair of a 20 mm sciatic nerve gaps.

> Application of hEC + hMSC confirmed better functional results compared to hEC + saline group.

> Our human epineural sheath conduit introduces a novel method for nerve gap repair and may serve as alternative approach to the standard autograft technique.

REFERENCES


CONCLUSIONS

Our human epineural sheath conduit introduces a novel method for nerve gap repair and may serve as an alternative approach to the standard autograft technique.

METHODS

Surgical Technique – Preparation of the hEC Conduit

1. Right sciatic nerve of rat 2. Creation of 20mm nerve gap 3. hEC transplanted into the gap 4. Filling of the Conduit with hMSC using a syringe 5. Conduit filled with saline

Surgical Technique – Nerve Gap Repair with hEC Conduit

1. Filling of the Conduit with hEC 2. Creation of 20mm nerve gap 3. hEC transplanted into the gap

Macroscopic Evaluation of hEC at 12 weeks after Nerve Repair

> No adhesions or local signs of inflammation
> Well preserved structure, shape and integrity of the grafts
> Macropores with collagen-like structures inside the conduit
> No signs of atrophy of the nerve distally to the conduit

Histological Results

Toluidine blue and immunofluorescent staining results are currently under evaluation.

REFERENCES


CONCLUSIONS

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