P19
CUTANEOUS COLLATERAL AXONAL SPROUTING RE-INNERVATES THE SKIN COMPONENT AND RESTORES SENSATION OF DENERVATED SWINE OSTEOMYOCUTANEOUS ALLOFLAPS

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Background: Reconstructive transplantation is a viable treatment option for select patients with devastating tissue loss. However, sensorimotor recovery is critical determinant of overall success of such transplants. Although the recovery of motor function has been studied extensively, the mechanisms of sensory re-innervation are not well established. Recent clinical reports of face transplants confirm progressive sensory improvement even when optimal repair of sensory nerves was not possible. This can be attributed to slow and steady collateral axonal sprouting from the periphery.

Methods: Denervated osteomyocutaneous flaps (n=8) in the form of a heterotopic hind limb transplant from MHC-defined MGH miniature swine were used to explore the contribution of collateral axonal sprouting in sensory re-innervation. The skin component of the flap was externalized for sequential biopsies. Serial sections were immunostained against a pan-axonal marker (PGP9.5) to visualize regenerating axonal structures in the dermis and epidermis. Collateral axonal sprouting rates were quantified using established stereology techniques.

Results: In all osteomyocutaneous alloflaps axonal sprouts from adjacent native recipient skin grew into the denervated skin component of the graft along the dermal-epidermal junction towards the center of the flap. On day 240 post-transplant, scattered dermal fibers were visualized 2.5 cm from the margin (rate of regeneration 0.1 mm per day) while both dermal and fine epidermal fibers were observed up to 1.5 cm from the margin. All animals had pinprick sensation in the peripheral part of flap within 3 months post-transplant.

Conclusion: Collateral axonal sprouting from the periphery can extend along dermal-epidermal junction to provide cutaneous re-innervation to the skin component of reconstructive transplants as well as denervated free flaps. Return of normal sensation through collateral axonal sprouting can revive interaction with the environment, initiation of defense mechanisms and aid in cortical re-integration of transplanted tissue.

P20
AN EXPERIMENTAL STUDY OF PARTICULATE BONE GRAFT FOR SECONDARY INLAY CRANIOPLASTY OVER SCARRED DURA

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Background: Inlay cranioplasty in children is difficult because autologous bone is limited. Cranial particulate bone graft effectively closes defects when placed over normal dura. The purpose of this study was to determine if particulate bone graft will heal when used for secondary cranioplasty over scarred dura.

Methods: A 17mm x 17mm critical-sized defect was made in the parietal bone of 8 rabbits and allowed to heal. Sixteen weeks post-operatively the 17mm x 17mm critical-sized defect was recreated and managed in two ways: Group I (no implant) (n=4) and Group II (particulate bone graft) (n=4). Particulate graft was obtained using a brace and bit from the frontal bone and placed over the scarred dura. Computed tomography was performed 16 weeks following the cranioplasty to determine ossification of the critical-sized defect.

Results: Control defects managed without an implant (Group I) healed 43% (range 11%-76%) of the area. Group II animals treated with particulate bone graft demonstrated superior ossification of the critical-sized defect; 94% (range 91%-98%) of the area healed (p=0.03).

Conclusions: Particulate bone graft ossifies inlay calvarial defects over scarred dura. Clinically, particulate bone graft may be efficacious for secondary inlay cranioplasty.