

Therapeutic Effects of a Placental Tissue-Derived Allograft on Fracture Healing

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Background:

As 5-10% of fractures will not heal without medical intervention, there is an ongoing need for effective treatments to promote fracture healing. CTM Biomedical produces human placental tissue-derived allografts that are used clinically and may assist in healing; however, no pre-clinical studies assessing these products have been performed. Our study investigating the impact of CTM products on the healing of a standard femoral fracture and a critical sized femoral defect (CSD) aims to fill this gap. We hypothesize that CTM product application will improve fracture healing and reduce pain-related behaviors.

Methods:

Femoral fractures were induced in 45 mice. CTM membrane, CTM paste, a combination of CTM membrane and paste, or saline was applied to each fracture. X-rays were taken twice weekly over 22 days, and blinded modified Radiological Union Scale for Tibia (mRUST) fracture scoring was performed. Complete blood analysis was conducted weekly. Following euthanasia 23 days post-surgery, μ CT and histomorphometric analyses were conducted. CSDs have also been surgically induced in the femurs of 95 mice, with plans for similar fracture analyses.

Results:

CTM product application did not significantly alter the levels of inflammatory cells, suggesting that the mice did not undergo immunological reactions. mRUST scoring indicated that CTM products may not alter fracture healing rates. However, combined application of CTM membrane and paste significantly increased the fracture callus's mineralized volume (by ~90%) and the percent of the callus that was bone. CTM membrane and paste application also led to an increased threshold for hind paw withdrawal, suggesting that CTM products may decrease pain-related behaviors.

Future Directions:

We hypothesize that in our CSD model, mice treated with the combination of CTM membrane and paste will display improved fracture healing and decreased pain-related behaviors. If shown to be effective, CTM product use may decrease fracture nonunion risk and increase comfort.