

Introduction

Functional recovery after peripheral nerve repair remains variable, particularly in scarred environments where perineural fibrosis may impair regeneration. Although biomaterial-based strategies have shown promise in preclinical models, translation into clinical practice remains limited. This study evaluated whether MatriDerm®, a collagen-elastin matrix, can improve functional and morphological recovery after sciatic nerve repair.

Methods

In this preclinical study, 44 female Lewis rats underwent right sciatic nerve transection and were randomized to four groups: epineural coaptation (EC), EC with MatriDerm® wrapping (EC-MD), autologous graft interposition (AG), and AG with MatriDerm® wrapping (AG-MD). Recovery was assessed weekly over 12 weeks using the Visual Static Sciatic Index (VSSI) and body weight. After euthanasia, nerves and target muscles were harvested for histological and histomorphometric analysis. Scarring was quantified using the connective tissue ratio (CTR).

Results

AG-MD animals showed significantly greater weight gain from postoperative week 3 onwards and superior functional recovery compared with AG from weeks 8 to 12. EC-MD animals demonstrated earlier functional improvement, with significantly higher VSSI scores at weeks 3, 5, 6, 8 and 9. Histological scar assessment using the CTR further showed significantly less perineural scarring in both MatriDerm® groups ($p<0.001$ for both), with preliminary histology suggesting improved tissue organization in treated nerves.

Conclusion

MatriDerm® wrapping was associated with reduced perineural scarring and enhanced early functional recovery after sciatic nerve repair, with the strongest effects observed in graft repairs. These findings support further translational investigation of MatriDerm® as an adjunct in peripheral nerve surgery and suggest a potential role for scar modulation in improving regenerative outcomes.

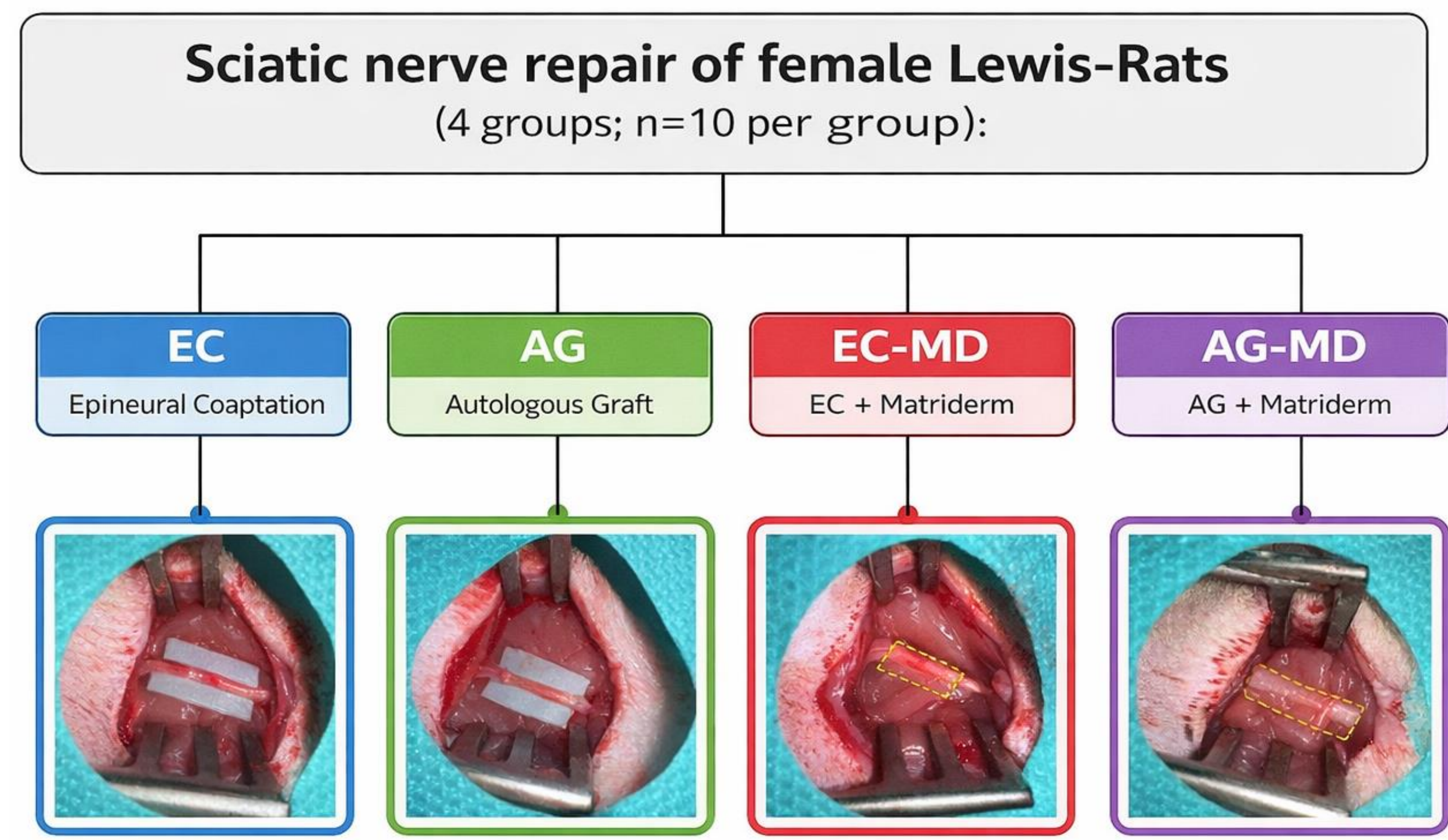


Figure 1: Experimental Groups.

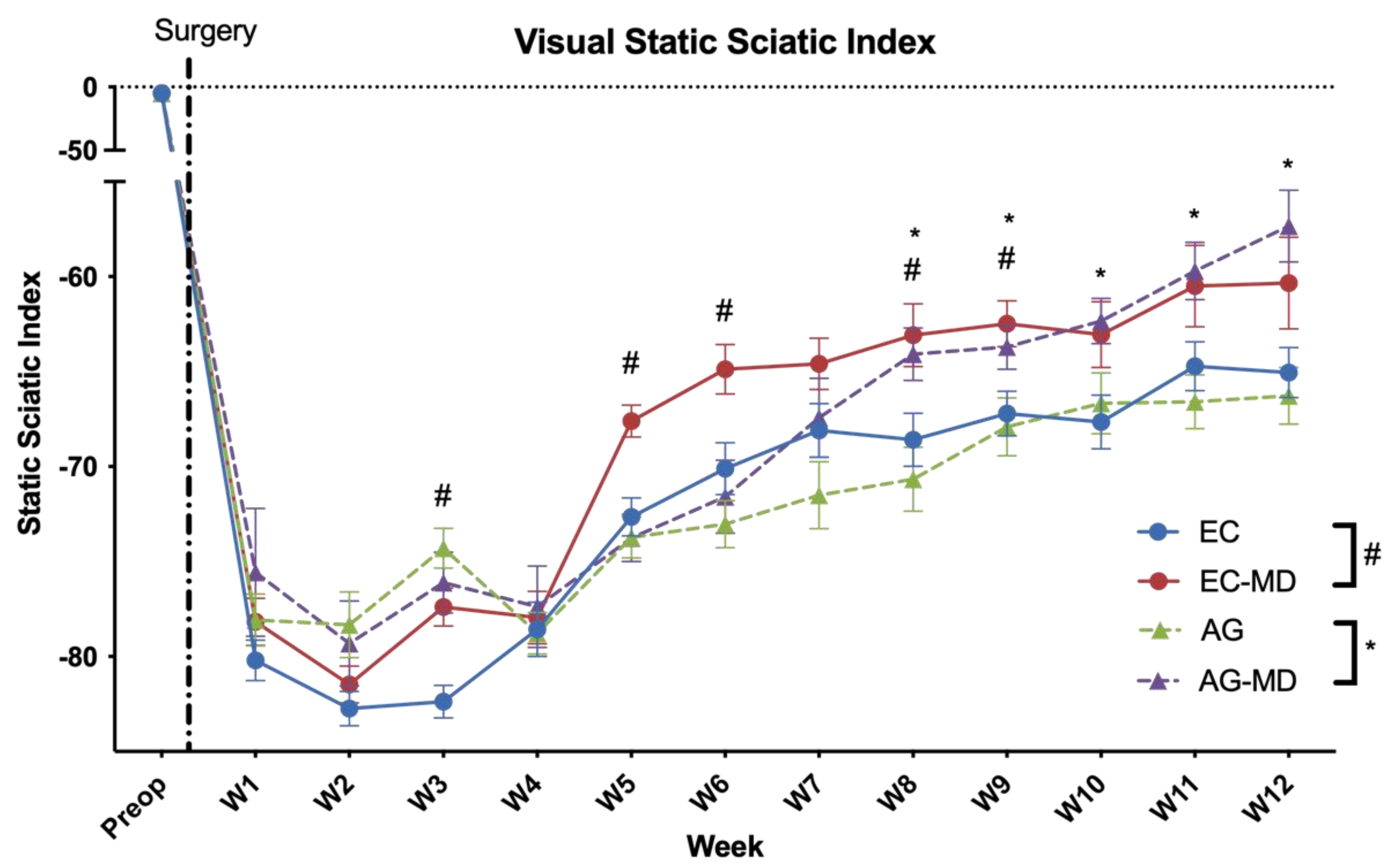


Figure 2: Functional Outcomes assessed via Visual Static Sciatic Index.

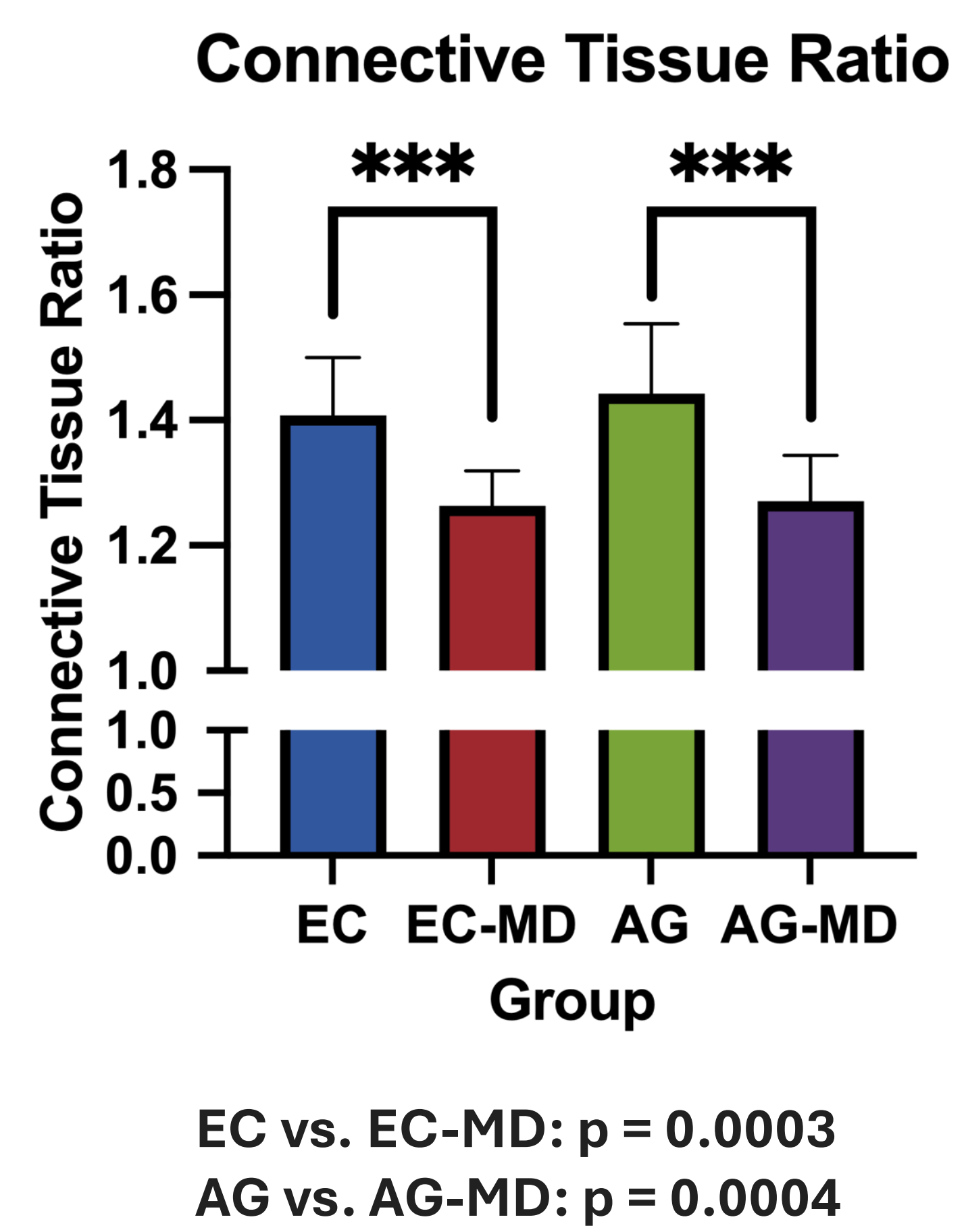


Figure 3: Connective Tissue Ratio