



# Current Understanding of Stem Cells in Oral Surgery

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## INTRODUCTION

Stem cells have provided promising potential for the field of tissue engineering and regenerative medicine. However, their application in the context of oral surgery and implantology for rehabilitation of bony defects and nerve damage due to iatrogenic injury in the oral cavity remains widely unclear.

Autologous bone grafting represents the current gold standard for alveolar bone regeneration. Recently, stem cell therapy has emerged as an appealing alternative to bone augmentation techniques and tissue rehabilitation.

The purpose of this study is to review the current role of stem cells and their clinical implications in osseous defect regeneration and nerve repair.

## METHODS

Human studies based on systematic reviews in English were used to limit bias. Articles were searched on PubMed with key terms: (stem cells) AND (oral surgery) AND (tissue regeneration).

## RESULTS

### STEM CELL OVERVIEW

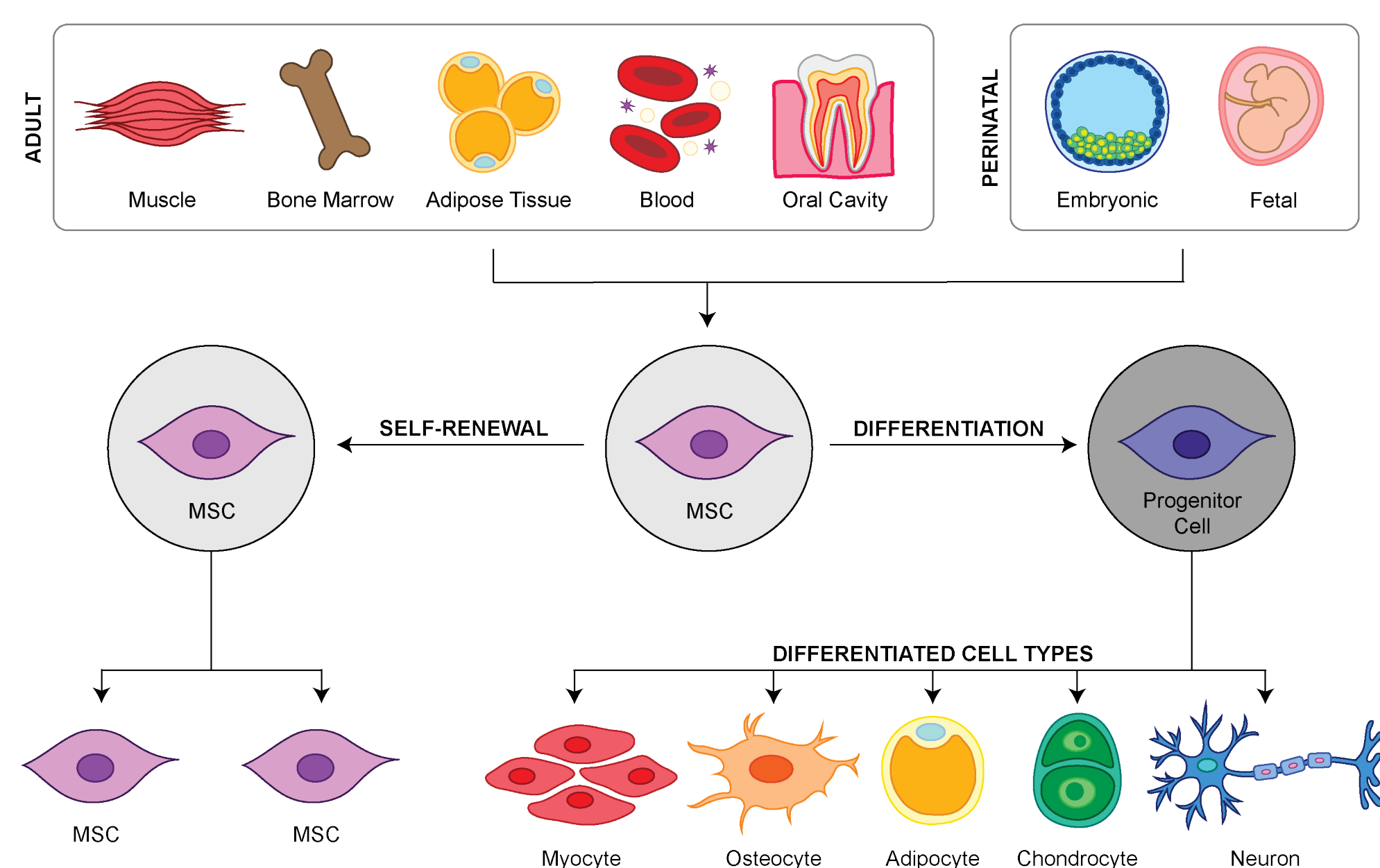


Figure 1: Mesenchymal stem cell sources and differentiation potential

### HOW DOES STEM CELL THERAPY WORK?

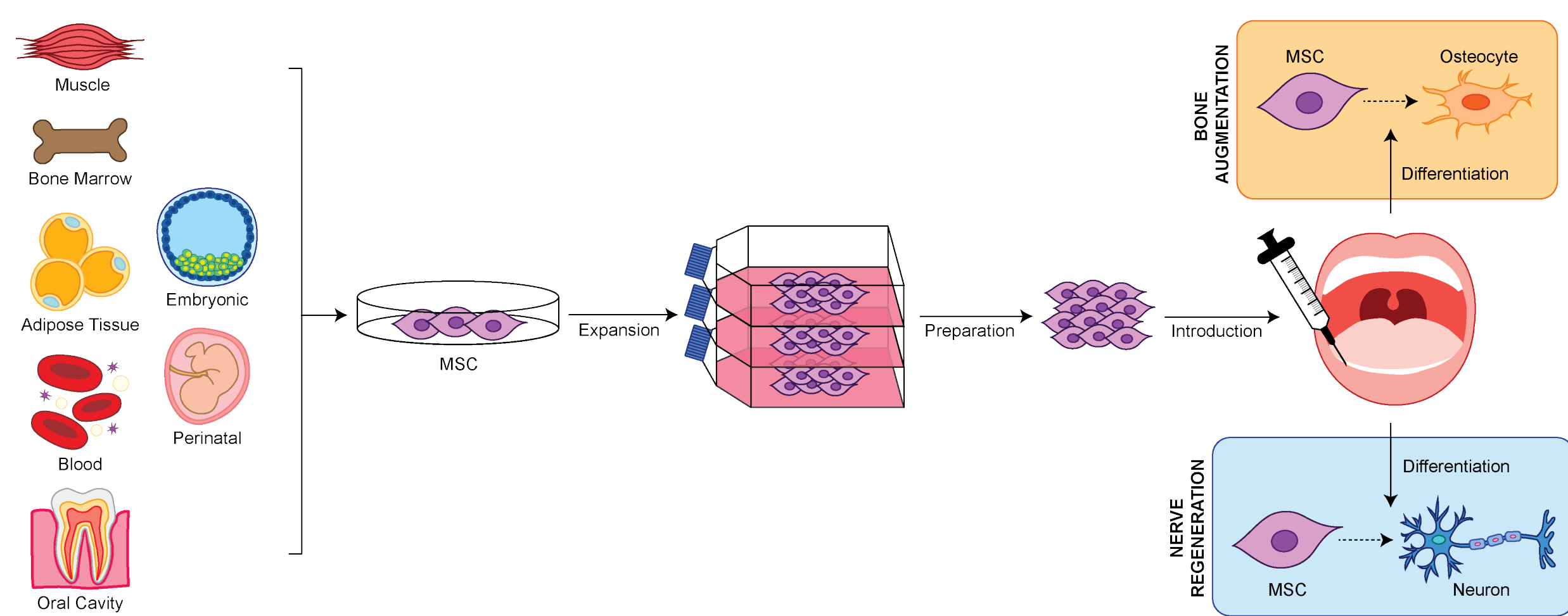


Figure 2: Isolation, expansion and integration of MSCs into sites requiring bone augmentation and nerve regeneration after injury

### STEM CELLS IN BONE AUGMENTATION

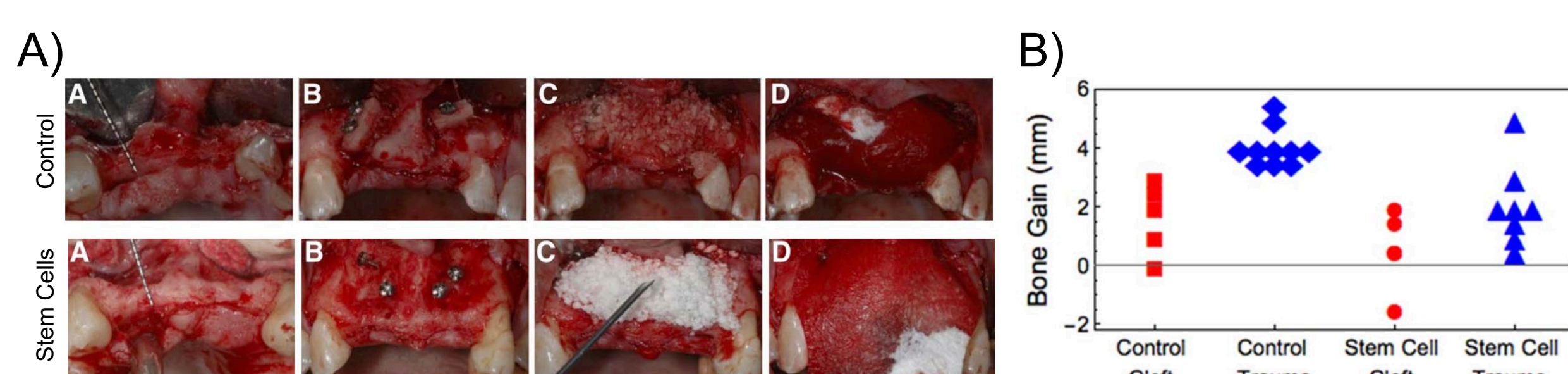


Figure 3: A) Control and stem cell therapy in treatment of horizontal alveolar ridge deficiencies in anterior maxilla using conventional block graft and bone marrow stem cell mixture, respectively. B) Alveolar ridge width gain at 4-month re-entry after treatment.<sup>1</sup>

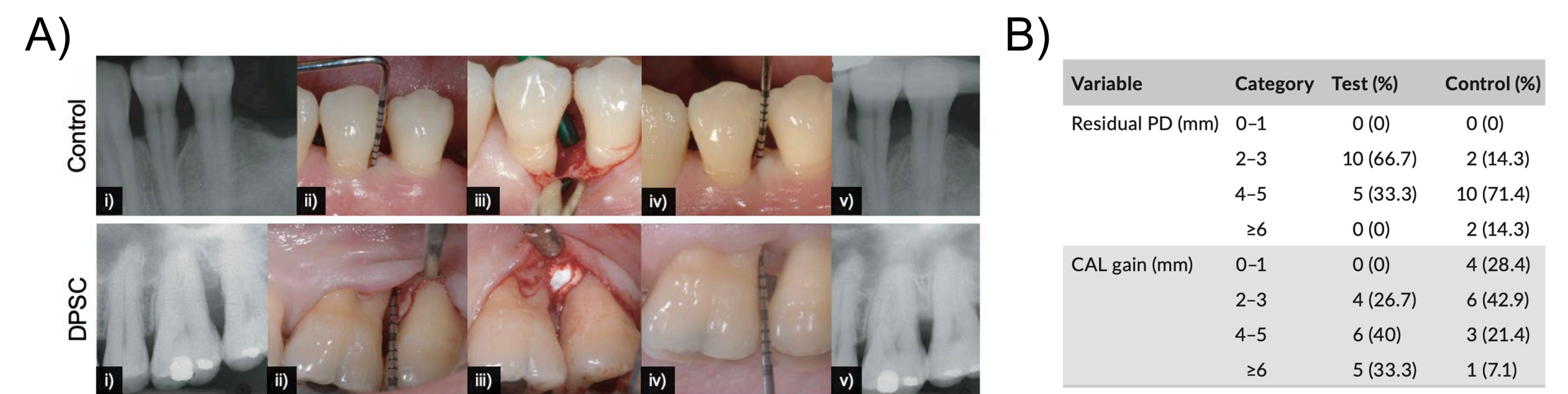


Figure 4: A) Preoperative radiograph (i) and clinical view (ii) of intrabony defects treated with collagen sponge alone or dental pulp micrografts (iii). Postoperative clinical view (iv) and radiograph (v) 12 months after treatment. B) Residual PD and CAL gain of intrabony defects measured 12 months after treatment.<sup>2</sup>

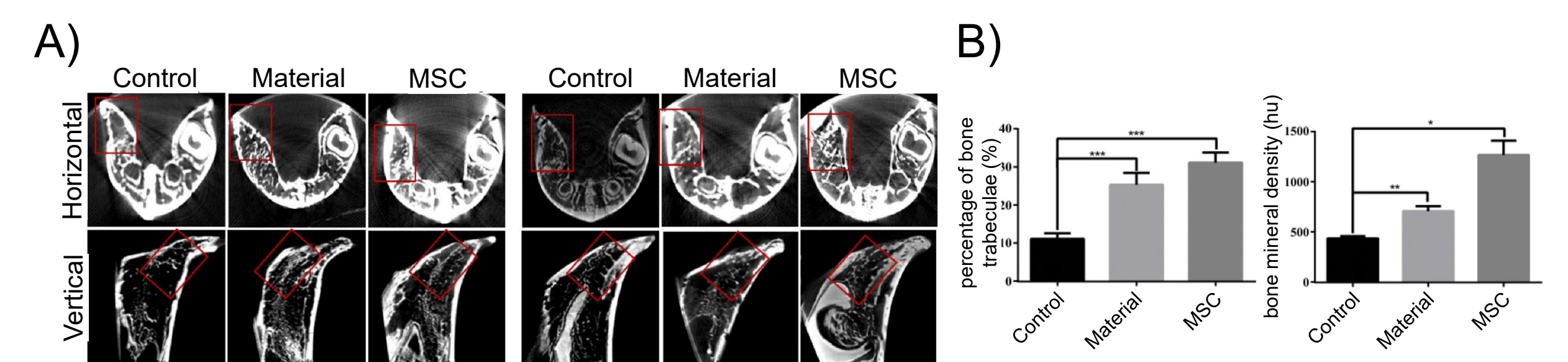


Figure 5: A) Micro-CT results of alveolar cleft bone defects of rabbits filled with nothing (control), bone collagen particles (material), and human umbilical cord MSCs, 3 and 6 months after surgery. B) Percentage bone trabeculae and bone mineral density 6 months after surgery, \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .<sup>3</sup>

### STEM CELLS IN NERVE REGENERATION

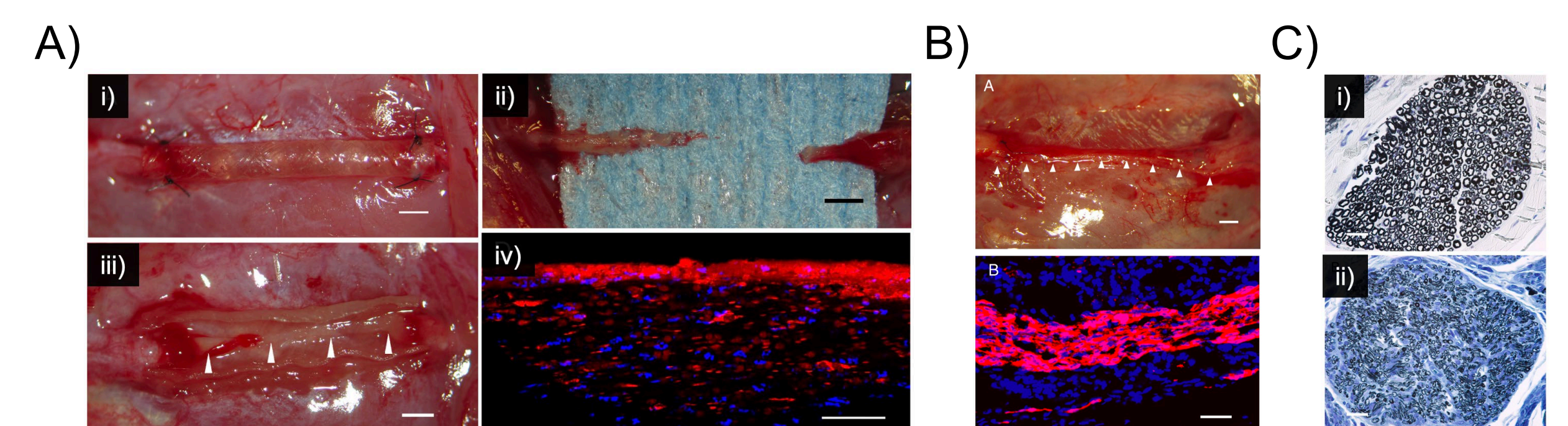


Figure 6: A) PLGA tube transplanted (i) into a 7mm gap of a facial nerve in rats. Regenerated nerve containing collagen gel alone (ii) or embedded with DPSCs (iii) with immunostaining (iv) 5 days after transplantation. B) Regenerated nerve 9 weeks after PLGA tube with DPSCs transplantation into facial nerve gap. C) Osmium-toluidine blue-stained samples of an intact facial nerve (i) and a regenerated nerve 9 weeks after transplantation of PLGA tube with DPSCs (ii).<sup>4</sup>

## CONCLUSIONS

The findings implicate stem cell therapy as a promising alternative to autologous bone grafting and a viable avenue for regeneration of iatrogenic nerve damage. The current literature suggests that the pluripotent potential of stem cells remains a hopeful turning point for multiple applications in oral surgery and implantology.

## REFERENCES

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