miR-15b as a Key Regulator of Impaired Angiogenesis in Pressure Ulcers

COLLEGE OF MEDICINE TUCSON
Surgery

Emilia Mora Pinos [1], Efua H Bolouvi [1], Anisha Apte[1],Jimena Canchis[1] ,Jacob Diermayr[1] ,Yona Leb Kleinerman [1] ,Stacy Skopp [1], Alyssa San Agustin[1] , Kenneth W. Liechty[1] ,Carlos Zgheib[1]

[1] Laboratory for Fetal and Regenerative Biology, Department of Surgery, University of Arizona Tucson School of Medicine, Banner Children's at Diamond Children's Medical Center

Background

Pressure ulcers (PUs) result from prolonged ischemia and impaired tissue perfusion, leading to chronic wounds. [1,2]

Angiogenesis, an important process in tissue healing and known to be dysregulated in pressure ulcers, is driven by hypoxia-inducible factor-1 alpha (HIF-1α) and vascular endothelial growth factor (HIF-1α) [2]

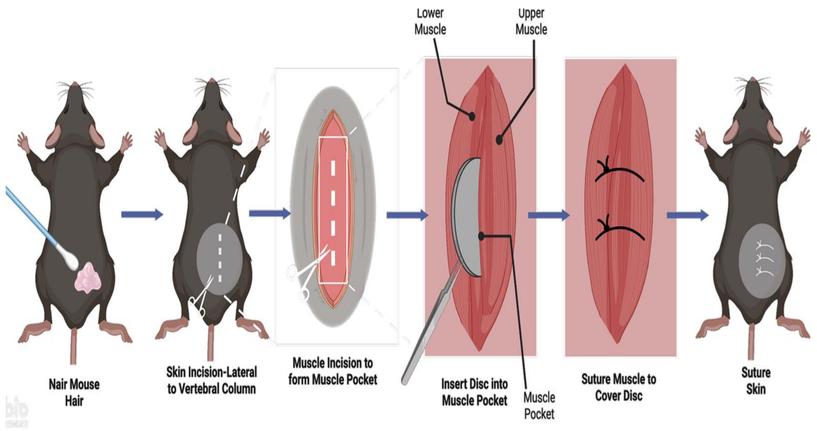
Hypothesis

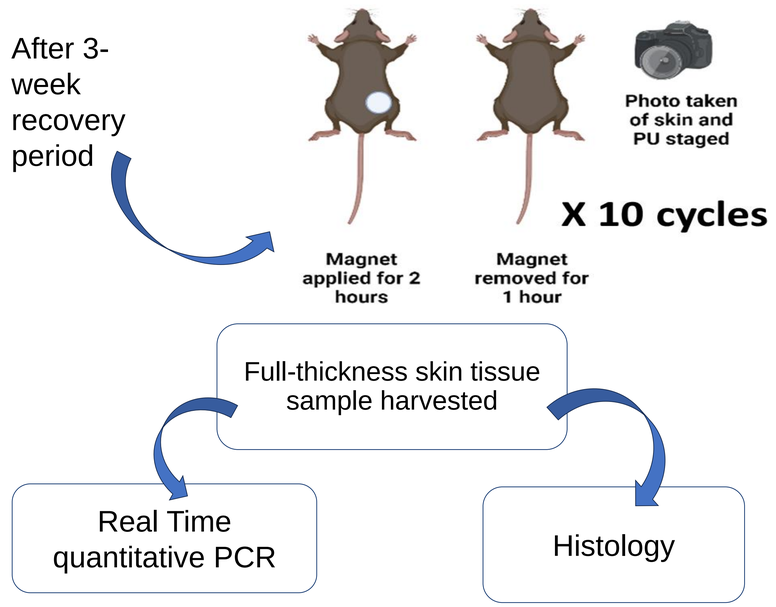
microRNAs, like miR-15b, may influence angiogenesis by modulating these pathways. Thus, we propose the hypothesis that impaired angiogenesis in pressure ulcers is due in part to dysregulated miR-15b levels.[3,4]

Methods

Under anesthesia, mice were implanted with a 6.35 mm steel disc under the external oblique fascia.

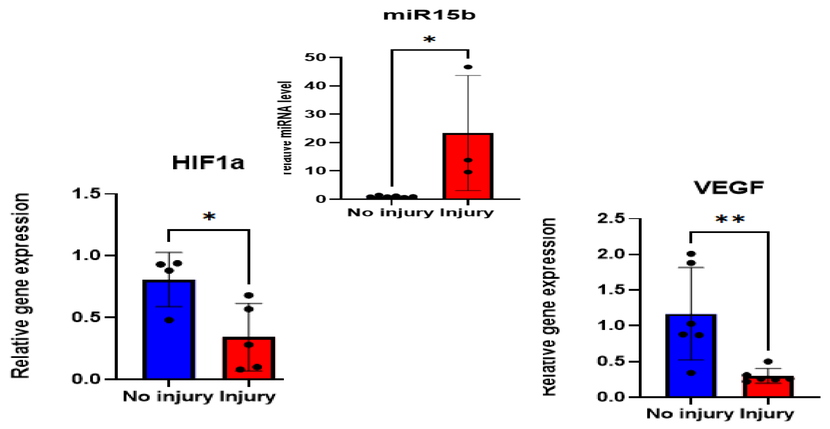
Disc Implantation Surgery





Results

Figure 1: miR15b upregulated expression, decreased gene effects and pathways in angiogenesis compared in injury and no injury. Expression of miR-15b and its regulatory effect in angiogenesis. Expression of miR-15b is upregulated (p=0.0226) in pressure injury wounds with associated reduction in gene expression of HIF1-a (p=0.0281) and VEGF (p=0.0347).



Conclusion

- Our findings reveal that miR-15b plays a critical role in the chronicity of pressure ulcers by suppressing vascular repair pathways through downregulation of HIF-1α and VEGF.
- The significant upregulation of miR-15b observed in pressure ulcers compared to healthy skin suggests its contribution to impaired angiogenesis.
- Targeting miR-15b could offer a novel therapeutic approach to enhance angiogenesis and improve healing outcomes.

Future Directions

- Future studies will focus on developing targeted therapies to inhibit miR-15b and evaluate their efficacy in promoting angiogenesis and wound healing in pressure ulcers.
- Exploring the molecular mechanisms underlying miR-15b regulation and its interaction with other pathways could provide deeper insights into its role and therapeutic potential in chronic wound management.

References

1. Padula, W. V., & Delarmente, B. A. (2019). The national cost of hospital-acquired pressure injuries in the United States. International Wound Journal, 16(3), 634-640. https://doi.org/10.1111/iwj.13071
2. Zaidi SRH, Sharma S. Pressure Ulcer. [Updated 2024 Jan 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK553107/
3. Banerjee, J., Chan, Y. C., & Sen, C. K. (2011). MicroRNAs in skin and wound healing. Physiological genomics, 43(10), 543–556. https://doi.org/10.1152/physiolgenomics.00157.2010
4. Xu, J., Zgheib, C., Hu, J., Wu, W., Zhang, L., & Liechty, K. W. (2014). The role of microRNA-15b in the impaired angiogenesis in diabetic wounds. Wound repair and regeneration : official publication of the Wound Healing Society [and] the European Tissue Repair Society, 22(5), 671–677. https://doi.org/10.1111/wrr.12217