HUMAN ATROPHIC NON-UNION FRACTURES ARE NOT AVASCULAR

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Introduction:

On average one in two people will sustain at least one fracture during their life. The majority of these fractures heal quickly. Unfortunately, however, some fractures are slow to heal and may remain un-united for several years. Currently non-union fractures are mainly categorised according to their X-ray appearance. Hypertrophic non-unions are often considered to be biologically active and vascular and have the potential to heal given the correct stable environment. In contrast atrophic non-unions are considered to be relatively avascular, acellular and inert, lacking the ability to heal even under the correct stable environment. The aim of the study was to investigate the vascularity of normally healing fractures and non-union fractures, in order to test the hypothesis that atrophic non-unions are less vascular than hypertrophic non-unions and normally healing fractures.

Materials and Methods:

X-rays were obtained immediately before the surgery at which the biopsy was taken. The X-rays were assessed by two independent observers and scored for hypertrophic or atrophic appearance. Biopsies were taken from the fracture site of twenty-two patients (mean age 46) with uninfected non-unions, eleven patients with hypertrophic (mean 13.8 months after fracture) and eleven patients with atrophic (mean 16.5 months after fracture). A comparison group was also included where biopsies of early fracture callus were obtained from five patients with normally healing fractures. These tissues were fixed in formalin and routinely processed and embedded in paraffin blocks. Sections of each biopsy block were immunohistochemically stained by a dual labelling technique of monoclonal antibodies JC70 (anti CD31) and Type IV Collagen to highlight vessels. The vascular density was then assessed using a validated technique\(^1\) in the three most vascular areas of the fracture site using a Chalkley Point eyepiece graticule at a magnification of x200.

Results:

The mean vessel density of the normally healing fracture group was lower than that of the two non-union groups but this difference was not found to be significant (p>0.05). The mean vessel density of the atrophic non-union group was slightly higher than that of the hypertrophic non-union group, however, this difference was not found to be significant (p>0.05). The study had a power of 90% of showing a 40% difference in the vessel density of the two non-union groups.

Discussion:

The study shows that there is no statistical difference between the number of blood vessels in the three fracture groups, therefore rejecting the hypothesis that atrophic non-union fractures are less vascular than hypertrophic non-union fractures or normally healing fractures. Andrew et al.\(^2\) considered that atrophic non-unions were better vascularised than hypertrophic non-unions. We, however, were not able to show a difference in vascularity between the three fracture groups. It would appear therefore that lack of vascularity in the later stages of healing is not the cause of persistent non-union.

Acknowledgements:

This work was funded by the Oxfordshire Health Services Research Committee.

References:


Comparison of Vessel Density in Three Fracture Groups

![Comparison of Vessel Density in Three Fracture Groups](image-url)