

**Warren, Madeline**

**From:** Mikhail Samchukov [msamchukov@globalmednet.com]

**Sent:** Thursday, January 31, 2002 7:34 PM

**To:** mwarren@aaortho.org

**Subject:** 1996 Research Ward Summary for Web Page  
January 31, 2002

David G. Haas, DDS, MS

President

American Association of Orthodontists Foundation

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RE: Award Program Web Page

Dear David:

Sorry for such delayed response - my address has changed and I just recently received your letter. Following please find information you requested.

Principal Investigators: Mikhail L. Samchukov, MD

Jason B. Cope, DDS, PhD

Co-Investigators:

J. David Ross, MFA

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Title of the Project:

MECHANICAL AND HISTOLOGICAL CHARACTERIZATION OF MEMBRANOUS  
BONE REMODELING FOLLOWING SAGITTAL DISTRACTION OSTEOGENESIS  
OF THE MANDIBLE

Institution:

This study was performed at TAMUSHSC - Baylor College of Dentistry through the Center for Craniofacial Research and Diagnosis and at Scottish Rite Hospital for Children, Dallas, Texas.

Brief Summary:

Osteodistraction provides a means whereby bone may be “grown” and molded into different shapes to more effectively address craniofacial skeletal deformities. In addition, the phenomenon of distraction histogenesis may allow larger skeletal movements with less risk of relapse. Furthermore, many of the congenital deformities that require extensive skeletal movements may be treated with fewer procedures to achieve the same structural, functional, and esthetic results commonly derived from modern orthognathic procedures.

Although various intrinsic and extrinsic biomechanical factors affect the clinical success of osteodistraction, device orientation must be a primary concern during treatment planning. When bilateral distraction devices were oriented parallel to the body of the mandible, proximal segment widening occurred, leading to histologic changes in the temporomandibular joint. In addition, undesirable forces and strains developed at the mandible. These strains may also develop within the regenerate tissue, potentially altering osteogenesis. When devices were oriented parallel to the common axis of distraction, these complications were minimized.

Histologically, three different types of maturing regenerates were evident during the consolidation period. Although the total amount of new bone seen in each type of regenerate varied, the final percentage of trabecular bone increased from zero to eight weeks of consolidation. Mineralization began at the host bone margins at the end of distraction and progressively increased up to the fourth week of consolidation at which time the mineral apposition rate remained stable for the following two weeks. Mineralization then decreased slightly from six to eight weeks of consolidation, as remodeling became the predominant activity of the regenerate.

The radiographic appearance of distraction regenerate formation is not as simple to interpret as previously thought. Rather, it actually reflects a progression of several types of initially mineralized regenerates into radiographically different, yet more advanced types. Critical factors for determining whether or not the distraction regenerate was clinically stable was the progressive increase in mineralization, the presence or absence of an interzone, and the width of the regenerate tissue relative to the width of the host bone segments. Radiographs taken in only one plane of reference may not be sufficient for determining the appropriate duration of consolidation. A more appropriate radiographic protocol should include occlusal or submentovertex radiographs for the transverse plane combined with panoramic or lateral oblique radiographs for the sagittal plane. Finally, in cases where an interzone is present, subtraction radiography and computed tomography provide a means for more accurately evaluating the level of mineralization within the interzone as well as the dynamics of mineralization over the course of distraction and consolidation.

Overall, the project culminated in 18 abstracts, 15 journal articles, and 16 book chapters. In addition, various aspects of the project have been presented over 40 times at both national and international meetings.

We sincerely thank the AAOF for supporting this project and hope that you are pleased with the final results.

Mikhail L. Samchukov, MD



AAOF Grant  
Summary.doc