



STRUCTURAL AND FUNCTIONAL CHARACTERISTICS OF THE PERIOSTEUM IN CHILDREN

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Abstract: The periosteum is a specialized connective tissue membrane covering the outer surface of bones and plays a crucial role in bone growth, remodeling, repair, and vascular supply. In children, the periosteum exhibits unique anatomical and physiological characteristics that distinguish it from that of adults. Pediatric periosteum is thicker, more vascular, and possesses greater osteogenic potential, contributing to rapid bone healing and regeneration. These age-related features are of significant clinical importance in pediatric traumatology, orthopedics, and reconstructive surgery. This article reviews the structural and functional characteristics of the periosteum in children and discusses their relevance to bone growth, fracture healing, and clinical practice.

Keywords: periosteum, children, pediatric orthopedics, bone growth, fracture healing, osteogenesis, bone remodeling, pediatric anatomy, skeletal development.

Introduction

The periosteum is a dense fibrous membrane that covers the external surface of bones, except at articular regions. It consists of an outer fibrous layer and an inner cambium layer containing osteogenic cells responsible for bone formation and regeneration. The periosteum serves essential



functions, including mechanical protection, vascular supply, sensory innervation, and participation in skeletal growth and repair. In children, the periosteum differs considerably from that of adults in both structure and function. The pediatric periosteum is thicker, more elastic, and more firmly attached to the underlying bone. Furthermore, it contains a highly active osteogenic layer that contributes significantly to longitudinal and appositional bone growth. These characteristics enable rapid fracture healing and explain many unique features of pediatric skeletal injuries. Understanding the anatomical and physiological properties of the periosteum in children is important for clinicians involved in pediatric trauma care, orthopedic surgery, and musculoskeletal research. Knowledge of these age-specific characteristics improves the diagnosis and management of fractures and other skeletal disorders. Therefore, the aim of this article is to review the structural and functional features of the periosteum in children and to evaluate their clinical significance in pediatric medicine.

Materials and methods

This study was conducted as a narrative review of the scientific literature concerning the anatomical and physiological characteristics of the periosteum in children. Relevant publications, pediatric anatomy textbooks, orthopedic references, and peer-reviewed articles were analyzed. Information regarding the structure, vascularization, osteogenic activity, and clinical significance of the pediatric periosteum was collected and systematically reviewed. The gathered data were compared with the characteristics of the adult periosteum to identify age-related differences. Particular attention was given to the role of the periosteum in bone growth, fracture healing, and skeletal development. The collected information was evaluated using descriptive and comparative analytical methods.

Results

The review demonstrated that the periosteum in children possesses several distinctive structural and functional characteristics. Compared with adults, the pediatric periosteum is significantly thicker, more vascular, and more biologically active. The inner cambium layer contains numerous osteoprogenitor cells that actively participate in bone formation and remodeling. The periosteum in children is loosely attached to the cortical bone, allowing it to remain partially intact during fractures. This characteristic contributes to the occurrence of specific pediatric fracture patterns, such as greenstick and torus fractures. In addition, the rich vascular network of the pediatric periosteum provides an abundant blood supply to developing bones. Enhanced vascularization promotes rapid delivery of nutrients and growth factors, facilitating bone growth and tissue repair. The osteogenic potential of the periosteum is particularly high during childhood. Following injury,



periosteal cells rapidly proliferate and differentiate into osteoblasts, resulting in accelerated callus formation and fracture healing compared with adults.

Discussion

The unique characteristics of the pediatric periosteum play a fundamental role in skeletal growth and development. Increased thickness and elasticity provide mechanical support while simultaneously protecting the growing bone from injury. The high concentration of osteogenic cells within the cambium layer contributes significantly to appositional bone growth and regenerative capacity. The strong regenerative potential of the periosteum explains the remarkable healing ability observed in pediatric fractures. Children often demonstrate faster union times and more complete remodeling of bone deformities than adults. These physiological advantages allow many fractures to be treated conservatively with excellent outcomes. Furthermore, the periosteum contributes to maintaining bone stability after injury. Because it often remains partially intact during fractures, it acts as a natural splint that helps preserve alignment and facilitates healing. From a clinical perspective, understanding the biological properties of the pediatric periosteum is essential for orthopedic surgeons and pediatric traumatologists. Surgical techniques that preserve periosteal integrity may enhance postoperative healing and reduce complications. Therefore, the periosteum should be considered a key factor in the management of pediatric musculoskeletal disorders.

Conclusion

The periosteum in children exhibits unique anatomical and physiological characteristics that distinguish it from the adult periosteum. Its increased thickness, rich vascular supply, elasticity, and high osteogenic activity contribute significantly to bone growth, remodeling, and fracture healing. These age-related features explain the rapid regenerative capacity of the pediatric skeleton and the unique patterns of fractures observed during childhood. Preservation of periosteal integrity plays an important role in achieving optimal healing outcomes. A comprehensive understanding of pediatric periosteal biology is essential for improving diagnostic accuracy, guiding treatment decisions, and optimizing orthopedic and traumatological care in children.

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