

- 1) Institute of Surgical Research, Rikshospitalet, Oslo, Norway, 2) Department of Pathology, Rikshospitalet, Norway, 3) Oslo Sports Trauma Center, Norwegian University of Sport & Physical Education, Oslo, Norway, 4) The University Hospital of Akershus, Lørenskog, Norway, 5) Martina Hansen Hospital, Bærum, Norway, 6) Oslo Orthopaedic University Clinic, Oslo, Norway

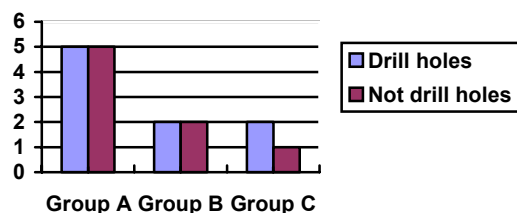
Retention Rate of Periosteum Flap in an Experimental Rabbit Model

Introduction The chondrogenic potential of periosteum is well known. This has been enhanced with the use of chondrocytes, which are injected under the periosteum coverage of the defect (1). Experimental studies show this to be promising though little is known about the retention rate of periosteum flaps and the effect of postoperative mobilization on that. This study investigates the effect of immobilization in cages versus free activity on the floor on the retention rate of periosteum flaps. In addition we investigate the effect of subchondral penetration of the defect according to the retention rate of the periosteum flap.

Experimental Method In eighteen New Zealand rabbits 22 weeks of age, a defect was induced in patella of both knees at time zero. After 2 weeks the defects were repaired. The surgical procedure included a bilateral arthrotomy using a biopsy punch ($\varphi = 4$ mm) to induce the cartilage lesion. Microsurgery instruments and a Zeiss stereomicroscope were used to secure removal of all the cartilage tissue in the defect down to the subchondral bone plate. At the rearthrotomy two weeks later, one of the knees was randomized to have 4 drill holes ($\varphi = 0,06$ mm) drilled by hand in the defect. A periosteum flap was harvested from the anteriomedial part of tibia and placed at the defect with the cambium layer facing down and sutured with four 9.0 sutures to the edge of the defect and glued with Tissel glue ®. The experimental rabbits were divided into three groups A: Rehabilitation in cages for five days, then sacrificed, B: Rehabilitation in cages for 5 days then free activity on the floor in 10 m² room until the end of second week, then sacrificed. C: Rehabilitation in cages for two weeks, then sacrificed.

Results Low retention rate (2/6) of periosteum flaps was found at two weeks irrespectively of postoperative rehabilitation as shown in figure. Even the remaining flaps these were observed to be rather flossy and seemed to be soon detaching from the defect.

Number of retained periosteum flaps.



The number of retained flaps was the same regardless of drill holes (9/18) or not (8/17) underneath the periosteum flaps. One knee was discarded from the experiment due to clinical signs of postoperative infection.

Discussion: Biomechanical stimulation of the repair tissue is considered to be a potent stimulator of a functional repair tissue. A complete immobilization of the joint may cause a longer survival of the flaps. Joint immobilization has harmful effects on periarticular and cartilage tissue, impairing their nutrition and metabolism and thus promoting their degeneration. The observation that periosteum has a high rate of delamination is also observed in other animal models (2). The need of preservation of periosteum of more than four days is not documented for the methods using cell transplantation under a periosteum flap. Though a more suitable way of keeping cells in the defect might however increase the cell concentration over a prolonged period and allow a more active rehabilitation and as such improve the current results of the present cartilage repair.

Conclusion: Periosteum flap as a reservoir or tent coverage of a cartilage defect filled with cells is not useful for more than four days if some restricted activity are allowed in an experimental animal model

Reference

1. Brittberg M, Nilsson A, Lindahl A, Ohlsson C, Peterson L: Rabbit articular cartilage defects treated with autologous cultured chondrocytes. *Clin Orthop* : 270-283., 1996
2. Driesang IM, Hunziker EB: Delamination rates of tissue flaps used in articular cartilage repair. *J Orthop Res* 18: 909-911., 2000

Acknowledgements and Sources of Funding

The Oslo Sports Trauma Research Center has been established at the Norwegian University of Sport & Physical Education through generous grants from the Royal Norwegian Ministry of Culture, the Norwegian Olympic Committee & Confederation of Sport, Norsk Tipping AS, and Pfizer AS.