

## EQUINE SUBCHONDRAL BONE CYSTS

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### Key Points

- Bone cysts can cause performance limiting lameness in horses
- Present therapies of subchondral bone cysts in horses are varied and there is no consensus on the best treatment
- Rethinking treatment of SBC from a biomechanical perspective may provide clues to better results than are currently achieved with cyst debridement.

Subchondral bone cysts, are a serious cause of lameness in the horse that can warrant a guarded prognosis for athletic potential.<sup>1,2</sup> They most commonly cause lameness in the first two years of life, and are associated with bone growth. They have been identified primarily in the medial femoral condyle of the femur and in the bones of the digit (metacarpus/tarsus and phalanges) but can occur in any location.<sup>1,2</sup> The two major hypotheses of etiology are 1) that the cyst is a developmental failure of ossification, or 2) cysts are caused by subchondral bone trauma. Both theories accept that inflammation (as manifest by high cytokine concentrations in the cyst tissues<sup>3</sup>) within the cyst is responsible for cyst enlargement. Clinically significant bone cysts occur most commonly at areas of increased weight bearing, supporting the trauma hypothesis. This hypothesis has been intentionally reproduced experimentally by creation of a cartilage defect with subchondral bone damage, which was followed by secondary invasion of synovial fluid.<sup>4,5</sup> This hypothesis is regarded as the hydraulic theory because weight bearing leads to increased mechanical pressure on the subchondral bone due to synovial fluid being pumped into the defect.<sup>5</sup>

Regardless of the location of the cyst, not all horses with SBC are lame at the time of discovery. Lameness associated with SBC is believed to be the result of synovitis and increased intracystic or intraosseous pressures leading to subchondral bone pain<sup>5</sup>, and it is unclear why some cysts are asymptomatic. Even when lameness is present, young horses with SBC usually do not have radiographic or arthroscopic signs of degenerative joint disease. In older or aging horses, the cystic lesions can be associated with osteoarthritis and a worsening prognosis.<sup>6,7</sup> It is commonly assumed that SBC on weight bearing areas are more likely to be lame, and the author believes that SBC on the proximal, and usually the convex, surface of the joints are also more likely to be symptomatic.

Treatment recommendations for SBC vary greatly and are somewhat controversial. Conservative management includes stall rest with or without intra-articular medication, usually corticosteroids. Surgical management consists of cystic debridement, intra-cystic injection with corticosteroids (transarticular or transcortical), cancellous bone grafting, mosaic arthroplasty, and placement of chondrocytes or mesenchymal stem cells in fibrin glue.<sup>8-14</sup> Collectively, the goals of these treatments are to minimize the size of the cyst, maximize the amount and quality of subchondral bone, and promote coverage of the healed subchondral defect with cartilage or fibrocartilage. Elimination of the subchondral bone defect associated with the SBC should promote joint surface healing, and reduce joint inflammation and potential damage to the meniscus. This long list of possible therapies suggests that uniformly successful results have not been achieved with any one therapy. Currently, arthroscopic debridement for MFC cysts is the generally accepted surgical treatment.

Radiographic healing of SBC regardless of treatment method is inconsistent and is considered to be unnecessary, although long-term follow-up of patients in case series is rare. When discussing prognosis with owners, consideration should also be given to a horse's intended use and intended duration of a horse's career; some performance horses have short careers, can afford and receive lots of veterinary care, and perform in disciplines where mild hindlimb lameness is not a major issue. In horses with 20 year performance careers and an absolute requirement for even travel (dressage), the standard of success is much higher. In horses with MFC SBC, conservative therapy results in 57-67% of horses becoming sound<sup>15</sup>, and similar outcomes are achieved for most surgical treatments. Cyst size and patient age also seem to have an impact on success rates. The similarity of success rates for surgical debridement and conservative therapy questions the unqualified endorsement of SBC debridement for the treatment of MFC cysts in all horses.

There is little case information available on the treatment SBC in locations other than the MFC. Reports of SBC in locations other than the MFC report a high rate for success for surgically treated horses and a much lower rate for conservatively treated horses, but conclusions about treatment should be drawn carefully as these case reports include multiple locations for SBC, occasionally evidenced a case selection bias (horses with pre-existing osteoarthritis were treated conservatively) and often had the goal of describing a surgical treatment.

In the last 50 years, orthopedic patients of all kinds have benefited from a greater understanding of the biomechanical forces on normal and abnormal bone, and how properly addressing biomechanics can improve fracture healing. There is very little information known about the biomechanics of equine joints and how it changes in the presence of a defect in the medial femoral condyle. It is unlikely that load is normally transmitted through the cyst, and the presence of sclerosis around the cyst and in the proximal tibia under the SBC suggests bone is adapting to altered loading. To address this possibility, we have begun using external fixation to alter the biomechanics of the bone in the region of a SBC to promote bone healing. This technique has been attempted in digital SBC<sup>16</sup>, and independently, we developed a technique for the medial femoral condyle. Biologic therapies have been used adjunctively<sup>13</sup>, and may also provide some benefit. It is our goal and our hope that the optimal treatment for bone cysts can be found to reduce the impact of this lesion on the performance careers of horses.

## References

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