Scapulohumeral osteochondrosis

A retrospective study of 32 horses

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Summary

Objectives: To review the outcome of equine shoulder osteochondrosis (OC) with surgical or conservative treatment. Methods: Retrospective study of 32 horses, less than two years of age, with scapulohumeral joint (SHJ) OC. The lesion severity was graded based on measurements taken from lateromedial radiographs. Follow-up information was obtained from racing records or telephone conversations with owners. Successful outcome was defined as the ability of the horse to perform its intended use. Results: Sixteen of 32 horses were affected bilaterally (48 joints). Eleven of 16 horses with bilateral OC underwent arthroscopic surgery; five had bilateral arthroscopy, six had unilateral arthroscopy of the most severely affected joint. Eight of 16 horses with unilateral OC underwent arthroscopy. The overall outcome was ‘poor’. Only 15.4% (4/26) of potential race horses started a race, whereas 66% (4/6) non-racehorses were ‘sound’ for the intended use. Statistical analysis evaluating the effect of breed on outcome showed a statistically significant difference. There were no significant interactions between outcome and gender, affected limb, unilateral versus bilateral involvement, treatment or severity of the radiographic lesion. However, radiographic lesion severity on the humerus and glenoid showed significant positive correlation. Clinical significance: The overall poor prognosis for shoulder OC in young horses appears to be, in part, dependent on breed and intended use. There was not any difference in outcome between surgically and conservatively treated horses.

Keywords
Osteochondrosis, shoulder, humerus, glenoid, racehorse

Introduction

Osteochondrosis (OC) is part of the developmental orthopaedic disease syndrome, which also encompasses physeal dysplasia (physitis), cuboidal bone malformation and angular as well as flexural limb deformities (1). Due to the frequency of its occurrence and the associated economic impact, it is considered one of the most significant skeletal disorders in growing horses. Epidemiologic data suggest the condition is present in the horse population at levels of 10–26% depending on the breed and progeny group (2–4).

In the horse, the sites of predilection include, in descending order, the tarsocrural, femoropatellar and metacarpophalangeal/metatarsophalangeal joints, followed by the scapulohumeral, coxofemoral and vertebral articulations (2–4).

Osteochondrosis of the scapulohumeral joint (SHJ) is considered to be the most severely debilitating form of osteochondrosis in the horse (2–5).

Affected horses are usually admitted with an intermittent lameness of insidious onset with a markedly shortened cranial phase of the stride. Pain can be elicited by extension, flexion or abduction of the limb. Shoulder musculature atrophy and contraction of the ipsilateral hoof are common findings (5).

Radiographic changes occur on the caudal humeral head as well as on the glenoid and include irregularities in the silhouette of the humeral head and glenoid cavity, subchondral bone sclerosis and radiolucency, and bone cysts (5–8). Secondary osteoarthritis is common (5–8).

Materials and methods

There are few published reports regarding the treatment and the prognosis of SHJ OC in the horse (5–8). According to common consensus, conservative treatment, consisting of stall rest, with or without ancillary treatment with hyaluronan, polysulfated glycosaminoglycans or steroid injections, is rarely successful in achieving subsequent athletic performance (5–8). More recent publications that have investigated the outcome following arthroscopic surgery of horses of various breeds and ages affected with SHJ OC, have been more encouraging (5–8). However, few of the horses in these studies were intended for a racing career and many were treated at an age older than is typically seen in horses with OC. Our experience in racehorses suggested that the prognosis was poor. The purpose of this study was to determine the outcome of horses that were admitted with lameness due to SHJ-OC at less than two years of age, and to correlate the outcome with treatment regimen, lesion severity and intended use.

The medical records for horses less than two years of age admitted to the New Bolton Center (University of Pennsylvania) from January 1990 to December 2002 for SHJ-OC were retrieved. Data were compiled on breed, age, gender, intended use, limb(s) involved, treatment regimen and outcome.

Lateromedial radiographs of the SHJ were examined for osteochondral fragmentation, osteophyte formation, subchondral bone cyst formation and evidence of subchondral sclerosis or lucency. The radio-
Lesion size was measured in length (cranio-caudal direction) and depth (proximal-distal direction) using a ruler (Figs. 1–4). The humeral head length (longest cranio-caudal distance measured at the level of the physis) and depth (longest distance from the articular surface to the physis) were also measured (black lines) to allow standardization of the respective lesion size.

Radiographic lesions on the humerus with a lesion to humeral head ratio of greater than 1:2 in length and depth, and a lateromedial surface ratio of greater than 2:7 were considered ‘severe’ (Fig. 3), whereas lesions with a ratio greater than 1:2 either in length or depth, with a lateromedial surface ratio less than 2:7 were graded as ‘moderate’ (Fig. 2). Smaller lesions were classified as ‘mild’ (Fig. 1). Radiographic lesions on the glenoid with a lesion to humeral head ratio of greater than 1:2 in length, greater than 1:3.75 in depth, and with a lateromedial surface ratio of greater than 1:6.26 (measurements on radiographs: 4 cm x 0.8 cm, 3.2 cm²) were considered ‘severe’ (Fig. 4), while lesions with a length ratio between 1: 2.43 and 1:2, a depth ratio between 1:6 and 1:3.75, and a lateromedial surface ratio less than 1:6.26 (measurements on radiographs: 3.5–4 cm x 0.5 – 0.8 cm, < 3.2 cm²) were graded as ‘moderate’ (Fig. 3). Smaller lesions were classified as ‘mild’.

The choice of treatment was based on the attending clinician’s preference. In many cases, conservative treatment had been attempted prior the decision being made to proceed with surgery.

Conservative treatment consisted of stall rest for three to eight months (mean: 5.3 months) with or without the additional administration of one or a combination of the following ‘disease modifying drugs’ (DMD): a course of several intramuscular injections of polysulphated glycosaminoglycan (Adequan®, Luitpold Pharmaceuticals Inc., Shirley, NY, USA).

The length and depth of the glenoid lesion have been measured (black solid lines).

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hyaluronan or a neutralceutical containing glucosamine HCL, sodium chondroitin sulfate, glycosaminoglycan and manganese ascorbate\(^b\) (dosage according to manufacturer guidelines).

Surgical treatment involved arthroscopic debridement of loose cartilage flaps and curettage of the underlying defect until bleeding subchondral bone was encountered using a previously described approach (6–8). Postoperatively, the horses were given stall rest for a mean of seven weeks (range: four to 12 weeks, median: six weeks) followed by hand walking exercise for a mean of 5.5 weeks (range: four to 12 weeks, median: four weeks) and then turn-out into a paddock for up to six months.

Since all of the horses that were included in this study were juveniles, a successful outcome was defined as soundness for the originally intended usage (racing for all Standardbreds and Thoroughbreds, non-racehorses: show–jumping, eventing or hacking). The horses that were not sound enough for their intended usage, but that were sound for alternative careers (i.e. hacking) were counted as failures.

Follow-up information was obtained by return visits to the clinic, examinations and radiographs conducted by referring veterinary clinics, lifetime racing records, when available, and telephone conversations with clients whose horse could not be examined by a veterinarian. Lifetime racing records were requested from the American Jockey Club or the United States Trotting Association for all of the horses that were older than two years of age at the time the manuscript was being prepared as well as those that were bred to race. The absence of a racing record was taken as a failure of the patient to race and was therefore counted as a negative outcome. Follow-up ranged from 11 months to 12 years. Follow-up radiographs, where available, were evaluated using the same methodology as described for the initial radiographic assessment and were compared to the initial radiographs.

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**Table 1** Treatment, outcome and disease severity of 32 horses with shoulder osteochondrosis.

<table>
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<th>Gender</th>
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\(b\) Cosequin\(b\), Nutramax Laboratories Inc., Edgewood, MD, USA.

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Data were analyzed using an analysis of variance (Stata 6 software, Stata Corporation, College Station, TX, USA). The level of significance was p<0.05.

Results

Thirty-two horses, 14 fillies and 18 males, between the age of six months and two years, which had been admitted to the equine hospital from January 1990 to December 2002, were diagnosed with SHJ OC (Table 1). The breed distribution, with a predominance for Thoroughbreds (16) and Standardbreds (10), was reflective of our hospital population. Other breeds (6) included three Thoroughbred cross, one Warmblood, one Warmblood cross and one Appaloosa.

Sixteen of thirty-two horses were affected bilaterally, usually with different degrees of severity on either side, for a total of 48 joints. Osteochondrosis was seen in equal numbers in the left (23) and right (25) SHJ. The humeral head alone was involved in 15 joints, the glenoid alone in eight joints and both humeral head and glenoid were involved in 25 joints (Table 2).

The radiographic lesion on the humerus was graded ‘severe’ in 11 joints ‘moderate’ in 17 and ‘mild’ in 20 joints.

The radiographic lesion on the glenoid was classified as ‘severe’ in eight, ‘moderate’ in 17 and ‘mild’ in 23 joints.

Ten of 16 horses with bilateral OC were operated upon; five underwent bilateral arthroscopy, and five had only unilateral arthroscopy of the more severely affected joint. The severity of the lesion, ranging from ‘severe’ OC bilaterally to ‘mild’ OC bilaterally did not appear to influence the treatment modality chosen or the outcome. One of these 10 horses, a thoroughbred racehorse, was sound for its intended use. Five of the six horses with bilateral OC that were treated conservatively became sound; however only three, (two non-racehorses and a Standardbred), were sound for their intended use (Tables 1, 3). The other two Thoroughbreds followed a career as a show jumper and a broodmare respectively. Disease modifying drugs, which were given to one horse managed conservatively and nine horses managed surgically, did not influence the outcome in horses with bilateral SHJ OC.

Eight of 16 horses with unilateral SHJ OC were treated surgically, two of which, both non-racehorses, were sound for their intended usage. One Thoroughbred became sound enough for pleasure riding. Of the eight horses with unilateral SHJ-OC managed conservatively, two racehorses, a Standardbred as well as a Thoroughbred became racing sound (Tables 1, 3). The administration of DMD did not have any effect on the outcome of horses with unilateral SHJ OC.

For 20 of the 23 operated joints, a description of the surgical appearance of the osteochondrosis was available. In 10 cases, the surgical appearance and the radiographic grade were equivalent, in the other 10 cases, the surgical appearance was considerably worse than expected, based on the preoperative radiographs. The underestimation of the size of the lesion on radiographs was similar for the humeral head and glenoid lesions.

The overall outcome was ‘poor’. Eight horses (25%) were sound for their intended use, three racehorses (9.4%) were sound on follow-up examination but were never raced for unknown reasons (one show jumper, one pleasure horse, one broodmare), eight horses (25%) became broodmares and a further eight horses (25%) were euthanized following treatment periods of 6–12 months (Tables 1, 3). The fate of the remaining five racehorses is unknown.

Radiographic lesions of the eight horses that were euthanized ranged from ‘mild’ to ‘severe’. Four of the eight euthanized horses were affected bilaterally, three of which underwent arthroscopic surgery, followed by an extended period of rest before euthanasia; the remaining horse was treated conservatively with rest and disease modifying drugs. One of the four horses with unilateral SHJ-OC, which was subsequently euthanized, was treated surgically and three were treated conservatively for at least six months prior to euthanasia.

Only eight (four non-racehorses, two Thoroughbreds and two Standardbreds) of 32 horses (25%), were sound for their intended use. The success rate for non-racehorses and racehorses was 67% (4/6 non-racehorses were sound for their intended use, three racehorses (9.4%) were sound on follow-up examination but were never raced for unknown reasons (one show jumper, one pleasure horse, one broodmare), eight horses (25%) became broodmares and a further eight horses (25%) were euthanized following treatment periods of 6–12 months (Tables 1, 3). The fate of the remaining five racehorses is unknown.

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use), and 15.4% (4/26 racehorses raced), respectively. The four non-racehorses pursued a career in show jumping (n=1), eventing (n=1) or trail riding (n=2). One Standardbred had bilateral SHJ-OC, severe on the left and mild on the right, and was treated conservatively (lifetime earnings: 0, developed carpal chip after one start). The second Standardbred had moderate unilateral SHJ-OC and was also treated conservatively (lifetime earnings: 0, unknown number of lifetime starts). One Thoroughbred racehorse had bilateral SHJ OC, mild on the left and moderate on the right, and was treated with bilateral arthroscopy (lifetime earnings: $1220, two starts). The second Thoroughbred racehorse was affected unilaterally and treated conservatively (lifetime earnings: $6015, four starts).

Follow-up radiographs were available for 10 horses, six of which had been treated surgically. The mean time between the onset of treatment and the follow-up radiographs was 19 weeks (median: 16 weeks, range 6–44 weeks). The radiographs showed improvement or no change in size of the humeral head lesion in all cases but deterioration of the glenoid lesion in one horse.

ANOVA analysis evaluating the effect of breed on outcome showed a statistically significant difference (p<0.05). Those horses that were not expected to race had a higher chance of achieving soundness for the intended use. There was a lack of statistically significant interactions between outcome and limb, gender, unilateral versus bilateral involvement, treatment or radiographic lesion severity on the humerus or glenoid. There was a significant positive correlation between lesion severity on glenoid and humerus (p<0.05, F=4.17). Neither severity nor location of the lesion on the glenoid versus the humeral head appeared to have had an influence on the treatment choice or outcome.

Discussion

In this retrospective study, the outcome of juvenile horses with SHJ-OC was ‘poor’ with only 25% (8/32) of the patients being sufficiently sound for their intended use. In contrast to previous reports of a SHJ-OC breed predilection for Thoroughbreds, the breed distribution in this study, with a predominance for Thoroughbreds and Standardbreds, was a reflection of our hospital population and was not indicative of any breed predisposition (9).

The strict success criteria (soundness for the intended useage), as well as the hospital population consisting mainly of racehorses, might have influenced the poor success rate. The breed had a significant influence on the outcome, with a significantly higher percentage of non-racehorses achieving soundness for their intended useage. While only 15.4% (4/26) of potential racehorses became sound for the intended use, 67% (4/6) of non-racehorses were sound enough to be able follow their planned career path (one show jumping, one eventing, two pleasure). This finding might help to explain previously reported success rates of 80% following arthroscopic treatment of shoulder osteochondrosis dissecans (OCD) in a case series of 15 horses, which included only four Thoroughbred race horses (their individual outcomes were not listed) (8). A second report that described the outcome of arthroscopic surgery for shoulder OCD in 11 horses, mostly Quarter Horses, achieved athleticism in 45% and soundness in 82% of horses (6). The number of horses that were destined to race was not specified, but 4/11 horses started race training.

In the study reported herein, 18 of 32 horses underwent arthroscopic fragment removal and debridement of a total of 23 shoulder joints that were affected with OCD of various degrees. The other 14 horses were subjected to conservative management. Four of the 18 (22.2%) were treated surgically, and four of the 14 conservatively managed horses (28.6%) became sound for the intended useage. Three more potential racehorses that were treated conservatively (21.4%) were sound but never raced (one show jumper, one pleasure horse, one broodmare).

Neither severity nor location of the lesion on the glenoid, versus the humeral head, appeared to have influenced the treatment choice or outcome. Pre-existing clinician bias based on past clinical experience or the need to satisfy the requests of owners, trainers and referring veterinarians likely contributed to this outcome. The administration of DMD, such as glycosaminoglycans, chondroitin sulphate or hyaluronan, which have been shown to slow cartilage degeneration, inhibit degradative enzymes and stimulate collagen and proteoglycan synthesis by chondrocytes in various species in vitro (10–26), did not result in any evident change in treatment outcome for surgically or conservatively treated horses in this study.

Conflicting reports have been published concerning the management of OC in human as well as in veterinary patients (27–32). Fragment size, stability, viability, and location greatly influence treatment options and outcome. Whereas excision of loose fragments with debridement of the fragment bed, as first described by Ambroise Paré in 1558, remains the mainstay of treatment for corpora mobile, the management of OCD without radiographically evident separation of osteochondral fragments is still equivocal (33). Those patients with stable OCD lesions have significantly better results after conservative treatment than after surgery (33, 34). As radiographs can remain abnormal for years, a consensus does not exist regarding the appropriate interval of rest for conservative management of osteochondrosis and return to exercise is governed mostly by symptoms. Success rates of approximately 50% have been reported following non-operative treatment of non-displaced OCD lesions in the human elbow and knee; however predicting which 50% will respond favourably to conservative management has eluded the orthopaedic community so far, thus posing a significant therapeutic dilemma (33, 34).

In horses, limited access to advanced imaging modalities, as are commonly employed in human patients, rarely allows diagnosis of OC in its early stages prior to development of radiographically apparent dissection. The importance of cosmetic and radiographic appearance, for sales purposes, additionally influences the treatment selection. Arthroscopic surgery therefore is the most commonly recommended treatment in order to achieve athleticism and to prevent the development of secondary degenerative joint disease.

The majority of horses affected with OC are admitted either as yearlings in the course...
of sales preparation for joint effusion or fragments on the repository radiographs, or as two-year olds after the initiation of training and the emergence of lameness. Shoulder OC, however, due to its debilitating nature, tends to be already diagnosed in weanlings. The detection of the lesions at an early age as well as the usually large size of the radiographic changes, has lead to attempts of conservative management in these cases in order to allow for natural regression and for healing to occur. In the equine hock and stifle, the window for regression and resolution of osteochondral abnormalities has been determined to be closed at five months for the hock and at eight months for the stifle (35). For the shoulder, that time frame has yet to be established. The constant loading of the majority of the articular cartilage in the shoulder and the large areas of articular surface involved in many cases of SHJ-OC, however, might affect its intrinsic healing ability and prognosis and warrant earlier surgical intervention than is commonly done in other joints.

In the equine stifle, medial condyle cartilage lesions ≤ 15 mm after arthroscopic debridement of subchondral cystic lesions, carried a 60.6% likelihood for racing, whereas the prognosis for racing soundness dropped to 30% for lesions > 15 mm (36). The large size of the SHJ-OC lesions in this study (58.3% [28/48 joints]) with humeral lesions ≥ moderate, 52% (25/48 joints) with glenoid lesions ≥ moderate, 52% (25/48 joints) with humerus and glenoid involved might have contributed to the poor outcome.

Evaluations of treatment results of SHJ OC in previously published reports as well as in this study have been retrospective, using racing records, assessments by clinicians and owners, and, in some cases, radiographic follow-up. The limitations of this review are a direct consequence of the retrospective design of the study. The reported cases were not randomly distributed to medical or surgical treatment, hence we cannot determine if there would have been a distinct benefit to surgical treatment, had the case selection been randomized. Economic and emotional factors often accounted for the treatment decisions. The statistically non-significant trend for better outcome with conservative management in the current study might be due in part to the fact that surgery was often performed after attempts of conservative management had failed. Earlier surgical intervention might have yielded better results. New techniques, such as arthroscopic reattachment of non-displaced OCD fragments and autogenous osteochondral grafting, might also help to improve the prognosis for this condition in the future (37–40).

In summary, the prognosis for shoulder OC in juvenile horses appears to be partly dependent upon their intended use. While only 15.4% (4/26) of potential racehorses achieved their intended use, 67% (4/6) non-racehorses were sound enough to follow their planned career path. In this study arthroscopic surgical debridement did not improve outcome.

References
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