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CANINE HIP DYSPLASIA: TREATMENT

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SUMMARY

There are many options in the treatment of Canine hip dysplasia (CHD). Each option has different criteria for patient selection and contraindications. Majority of dogs with CHD can enjoy a relatively pain-free life if they are properly treated. The best option of treatment should be the one that is most acceptable and affordable to the owner.

Keywords: Canine, hip dysplasia, treatment

INTRODUCTION

Young patients with canine hip dysplasia (CHD) are usually presented with pain associated with joint laxity, whereas the older dogs exhibit lameness as a result of secondary degenerative joint disease (DJD) (Burns *et al.*, 1987; Morgan, 1987). The main objective for treatment of young patients is prevention of cartilage damage while older patients require therapy to alleviate pain and suffering related to the irreversible changes of a chronically arthritic joint (Johnston, 1992).

CONSERVATIVE AND MEDICAL TREATMENT

The two most important components of conservative management of CHD are weight reduction and restriction of exercise, which decrease the stress placed on the hip joints and peri-articular tissues. These minimise the inflammation of the joints and alleviate pain (Johnston, 1992; de Haan *et al.*, 1993).

Swimming or physiotherapy provides the advantages of exercise, which maintain cartilage nutrition, strengthen the muscles and prevent disuse atrophy (Johnston, 1992).

Pain relief for hip dysplasia is provided mainly through the analgesic and anti-inflammatory actions of non-steroidal anti-inflammatory drugs (NSAID). These drugs inhibit cyclooxygenase, which is necessary in prostaglandins formation. Preventing the release of prostaglandins decreases inflammatory process and therefore, reduces the pain. NSAID also reduce the release of other inflammatory enzymes, stabilise lysosomal enzymes and decrease migration of polymorphonuclear cells (Tomlinson and McLaughlin, 1996). The most commonly used NSAID are buffered aspirin, phenylbutazone and meclofenamic acid. Generally, buffered aspirin is the drug of choice because it is effective, relatively cheap and readily available while particularly effective in alleviating musculoskeletal pain (Fox and Burt, 1987; Johnston, 1992; de Haan *et al.*, 1993). The dosage of buffered aspirin is 25 mg/kg twice daily (Fox *et al.*, 1987).

In some dogs, phenylbutazone is more effective. For long term use, a dosage of 1 mg/kg is divided into 2 or 3 daily doses, but doses as high as 4 to 5 mg/kg can be used for short periods of time (Fox *et al.*, 1987). Meclofenamic acid can be effectively used in treating DJD in dogs. The dose is 1.1 mg/kg for 4 to 7 days before it is reduced to 0.5 mg/kg. The disadvantage of meclofenamic acid is that it causes gastrointestinal irritation (Tomlinson and McLaughlin, 1996).

Carprofen, a propionic acid-derived compound, is a new NSAID developed for use in treating dogs with DJD. It has anti-inflammatory, analgesic and antipyretic properties (Fox and Johnston, 1997). In a study by Holtsinger *et al.* (1992), carprofen has been shown to be efficacious in acute relieve of clinical signs associated with canine DJD. The reported dose for carprofen is 2 mg/kg twice daily (Holtsinger *et al.*, 1992; Vasseur *et al.*, 1992).

Corticosteroids are another group of drugs that have been used to treat DJD in dogs. They are quite effective due to their potent anti-inflammatory effects. However, they are not widely recommended because they also inhibit proteoglycans and collagen synthesis by the chondrocytes resulting in matrix depletion. Corticosteroids should be reserved for use in older dogs with end stage DJD, which are unresponsive to other drugs (Tomlinson and McLaughlin, 1996). Even then, the dose of corticosteroids should be used as low as possible.

Polysulphated glycosaminoglycans (PSGAGs) are a highly sulphated mixture of glycosaminoglycans made up mainly of chondroitin sulphate extracted from bovine trachea and lungs. In recent years, there have been reports of successful clinical use of PSGAGs in dogs, suggesting that they may be valuable in the management of CHD. The reported benefits include inhibition of destructive proteases in synovial fluid, stimulation of proteoglycan synthesis, increase in

hyaluronic acid synthesis and minimisation of cartilage fibrillation and erosion. However, the mechanism of action of PSGAGs is not completely understood (Burns *et al.*, 1987; de Haan *et al.*, 1993; Tomlinson and McLaughlin, 1996). Lust *et al.* (1992) revealed some beneficial effects of PSGAG on puppies with CHD. However, in a double blind clinical study using PSGAGs to treat dogs with chronic advanced CHD, no beneficial effect could be found (de Haan *et al.*, 1994). Lack of response might have been due to the fact that cartilage damage was extremely severe that not much normal cartilage remained in the joint. The study suggested that PSGAGs should be reserved for dogs with milder, less advanced CHD. Tomlinson and McLaughlin (1996) suggested a dosage of 5 mg/kg intramuscularly every 4 to 7 days for a period of 6 to 8 weeks. At the dose rate of 0.6 mg/kg weekly, PSGAGs can be administered intra-articularly. The intra-articular injection of PSGAGs may cause joint effusion.

Glucosamine is the major sugar found in glucosaminoglycans and hyaluronate. It is believed that the mechanism of the drug is through providing raw material for the synthesis of glycosaminoglycans and hyaluronate, as well as providing regulatory stimulus. Cosequin® (Nutramax Laboratories) contains glucosamine and is promoted as a nutraceutical chondroprotectant for the treatment of DJD in dogs and horses. However, there has been no report of controlled studies using Cosequin® in the treatment of CHD in dogs (Tomlinson and McLaughlin, 1996). Despite a lack of well-designed clinical trials, it has been reported that many animals treated with Cosequin® have experienced positive effects, ranging from reduced dependence on anti-inflammatory drugs to dramatic increase in mobility and increase in muscle mass (Moore, 1996). Cartiflex® (Pharmadica) and PET POWER® (Pet Power Inc.) are two other nutraceutical chondroprotectant drugs that contain glucosamine currently available in the market. Both are recommended for treatment of joint problems.

SURGICAL TREATMENT

There are a number of appropriate surgical treatments with varying degrees of technical difficulty and costs. Corrective surgeries include triple pelvic osteotomy to re-orientate the acetabulum and three-plane intertrochanteric femoral osteotomy to re-orientates the femoral head. The salvage procedures include total hip replacement and femoral head arthroplasty. The total hip replacement replaces the dysplastic hip joint with a prosthesis while the femoral head arthroplasty removes the affected femoral head. The pectineal myectomy/myotomy are muscle release operations performed to relieve pain in the dysplastic hip. A more recent surgical treatment for CHD is the biocompatible osteoconductive polymer (BOP) shelf arthroplasty.

Triple pelvic osteotomy (TPO)

The concept of axial rotation of the acetabular segment has evolved over the last 20 years from work done on children with congenital dislocations of the hip and on older patients with dislocated femoral heads. Hohn and Janes (1969) described a technique called pelvic osteotomy as a surgical procedure for treating CHD. This procedure redirects the acetabulum and provides stability. Schrader (1981) performed a triple osteotomy of the pelvis concurrently with a trochanteric osteotomy as a treatment for CHD. In 1986, Slocum and Devine (1986) published a pelvic osteotomy technique for axial rotation of the acetabulum.

The main objective of TPO is to prevent the development of DJD by repositioning the acetabulum over the femoral head. This provides both congruency and stability to the dysplastic hip, which appears to decrease the rate of DJD progression. Only those joints with minimal or no pre-existing DJD should be considered as candidates for the procedure (Schrader, 1981; Schrader, 1986; Slocum and Devine, 1986; Slocum and Slocum, 1992). Severe DJD with osteophytes eliminates the possibility of congruency and the use of this procedure. The ability of the reconstructed joint to adapt or remodel should also considered. Thus, the most favourable outcome is expected when the procedure is performed on dogs of less than 1 year old. The angles of subluxation and reduction are measured and the acetabulae are then rotated according to these angles. Hence, each hip is corrected individually (Schrader, 1981; Schrader, 1986; Slocum and Devine, 1986; McLaughlin and Miller, 1991; Slocum and Slocum, 1992).

Most results of the TPO technique are quite satisfactory. Functional ability was found to be satisfactory in 93% of the limbs (Schrader, 1986) and the progression of DJD was slowed to a minimal rate based on radiographic examinations (Slocum and Devine, 1986; Koch *et al.*, 1993; Heng, 1997). The joint congruence was significantly improved after TPO as indicated by the measurements of the Norberg angle and the percentage coverage of the femoral head (Slocum and Devine, 1986; McLaughlin and Miller, 1991; Koch *et al.*, 1993). Heng (1997) in his study has shown that the improvement in joint congruency is also due to the re-modeling processes of the cranial acetabular edge.

Intertrochanteric osteotomy

The purpose of intertrochanteric osteotomy is to re-establish or improve the contact area of the acetabular and femoral head surfaces and thus, improves the biomechanical function of the hip joint. This is

accomplished by changing the position of the femur relative to the acetabulum in three planes. The first plane, the inclination of the femoral neck, is changed from a valgus to a varus position. The second plane, the anteversion of the femoral neck, is rotated toward normoversion. Finally, the third plane is medialisation of the femoral head, neck and trochanteric region in relation to the shaft of the femur. This procedure is indicated when both the radiographic and clinical signs of early stage CHD are present (Barden and Prieur, 1992).

Results of statistical analysis indicate that the procedure is helpful for up to 3 years after surgery (Barden and Prieur, 1992). Evers *et al.* (1997) reported that the post-operative follow up evaluation of the patients did not differ significantly from the pre-operative examination. The follow-up radiographs also showed significant progression of DJD than the pre-operative radiographs. Thus, this procedure failed to prevent the progression of the DJD. Insufficient data on the long-term effects did not allow any conclusion to be made on the long-term benefits of the surgery (Barden and Prieur, 1992; Evers *et al.*, 1997).

Total hip replacement

Total hip replacement is technically demanding and should only be performed by those specifically trained in this procedure. It is the treatment of choice for medium and large-sized dogs with moderate to severe DJD and clinical signs of CHD. It is contraindicated in dogs that do not have lameness or pains caused by coxofemoral disease, regardless of the radiographic appearance. Other contraindications include infection anywhere in the body, neurological disease affecting the rear legs, concurrent orthopaedic problems and dogs with an open trochanteric physis. The most common complications are aseptic loosening, luxation, infection, ischiatic neuropraxia and iatrogenic fracture. Improvements in patient selection, design of implants, surgical technique and post-operative care have dramatically decreased the incidence of complications and improved the success rate to over 90% (Fox *et al.*, 1987; Montgomery *et al.*, 1992; de Haan *et al.*, 1993).

Budsberg *et al.* (1996) found that there was significant increased in loading function of the treated hind limb 6 months after unilateral total hip replacement. The ground reaction forces of the treated hind limb were also increased. By 3 to 6 months post-operative, there were no significant differences between the treated and untreated hind limb.

Excision arthroplasty

Excision arthroplasty is the surgical procedure, which removes the femoral head and neck so that a false, fibrous joint may be formed as early as two weeks after the operation. This is a non-reversible procedure and must be considered as a salvage operation. Secondary DJD resulting from CHD is the most common indication for the procedure. The main goal of this procedure is to relieve hip pain secondary to DJD and regain functional use of the hip and affected leg. This procedure is the treatment of choice for dogs weighing less than 20 kg. The post-operative fibrous joint has a restricted range of motion and less stability than the normal hip joint. This procedure causes slight shortening of the affected leg and results in slight gait abnormality. Excision arthroplasty results in good to excellent restoration of the leg function in about 80% of the cases (Fox *et al.*, 1987; Lippincott, 1992; de Haan *et al.*, 1993).

Large-breed dogs do not respond as well to the standard excision arthroplasty. Thus, excision arthroplasty with a biceps muscle sling is recommended for these dogs. The principle of this procedure is to interpose a muscle pad between the excised bony components. Post-operative results through client questionnaire were reported to be good in 88% of the patients (Lippincott, 1992).

Pectineal myectomy / myotomy

Pectineal myectomy/myotomy involves excision or transection of the pectineus muscle. The main objective is to relieve pain and rehabilitate the patient. It is believed that pain relieve comes from the easing of the tension on the joint capsule caused by the upward force on the joint from the tense pectineus muscle as well as the increased range of abduction that occurs after the surgery. However, this procedure does not prevent the progression of CHD. Degenerative joint disease continues at least as fast as would be expected without surgery and lameness and hip pain can be expected to recur in the future. Pectineal myectomy/myotomy results only in temporary relief of pain in some patients. Thus, the procedure can be used for dogs whose owners cannot afford the cost of reconstructive procedures or where medical management has not been satisfactory. It is also indicated in dogs with advanced CHD where the owner wants to use the dog during a forthcoming hunting season or a field trial event (Wallace, 1992; de Haan *et al.*, 1993).

BOP shelf arthroplasty

A newly described technique that can be applied on patients without osteotomies before using salvage procedures is the BOP shelf arthroplasty. This polymer is supposed to act as a scaffold for bone in-

growth. The BOP fibre block complex acts as a barrier to craniolateral subluxation of the femoral head. The results of the procedure have been reported to be satisfactory with a success rate of 99% in animals available for follow-up (Jensen and Sertl, 1992). However, there has been a report suggesting that there may be interference to the osteoconductive properties of BOP by fibrous tissue (Lussier *et al.*, 1994). Oakes *et al.* (1996) also reported that the implant has no histologic evidence of osteoconductivity. Ossification of shelf arthroplasty was found to be unsatisfactory and its use in the treatment of CHD has yet to receive widespread endorsement.

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RINGKASAN

DISPLASIA PINGGUL KANIN: RAWATAN

Terdapat banyak pilihan dalam rawatan displasia pinggul kanin (CHD). Setiap pilihan rawatan mempunyai kriteria berlainan untuk pemilihan pesakit dan kontrapentunjukan. Majoriti anjing mengidap CHD boleh menikmati hidup agak tanpa sakit sekiranya dirawat dengan betul. Pilihan rawatan mesti merupakan yang paling menyenangkan dan murah bagi pemiliknya.