FRAGMENTED CORONARY PROCESS AS AN ELEMENT OF ELBOW DYSPLASIA.
BALANCE OF TWO YEARS OF EXPERIENCE

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Abstract

This article aims to compare the treatment of fragmented coronary process in the context of clinical results. Forty-two dogs of both sexes, aged from 5 months to 2 years, all belonging to the predisposed breeds, were tested. Each patient was subjected to radiological and clinical examination on the basis of which was classified into one of four degrees of dysplasia according to criteria of the International Elbow Working Group. Then the decision towards specific therapeutic procedures, operational or pharmacological, was taken. About 4 - 12 weeks after the surgery, the control examination was performed. It allowed to assess the post-surgery mobility. The results depended on the age of animal at which treatment was carried out, and the degree of degenerative changes in the joint. The studies have shown that the best results were obtained in a group of dogs aged 5-9 months, in whom a dynamic ulna osteotomy was performed. This indicates the need for early diagnosis of disease and rapid implementation of the treatment, to eradicate the problem of radial- ulnar incongruity, thereby preventing the development of further changes within the joint.

Key words: dog, elbow, joint, coronary process, therapy.

Elbow joint dysplasia is a developmental disease of bones and joints - one of the most common causes of thoracic limb lameness in dogs (17). Disease leads to changes in biomechanics of the elbow joint work and consequently to the development of degenerative changes (DJD - degenerative joint disease). Left untreated, dysplasia elbow leads to impaired function of the limb. Fragmented coronary process is the most common type of the disease (17). The problem usually occurs in dogs between 5 and 10 months of age. As a result of impaired growth of the bones of the forearm, there is the so-called radial-ulnar incongruity (radial bone becomes shorter), resulting in a detachment of the coronary process. Free fragment irritates joint as "a stone in the shoe" leading initially to the appearance of inflammation, and eventually to the development of degenerative changes. If treatment is not introduced in time, the changes in the joint may be so advanced that the dog will limp to the end of life. Hence, the diagnosis of the disease and its early treatment are very important.

Material and Methods

In 2007-2009, 42 (26 males and 16 females) dogs, in the age from 5 months to 2 years, affected with dysplasia of elbow joint, in the form of fragmented medial coronary process were diagnosed and treated in the Department of Surgery, University of Life Sciences in Wroclaw. In the group of treated animals, there were the following breeds: Labradors - 17, Bernese dogs - 12, German shepherd - 7, Golden retrievers - 4 and Newfundslands-2. The animals were diagnosed on the basis of clinical orthopedic and X-ray examinations. In all patients, the criteria of classification of dysplasia by the International Elbow Working Group (IEWG) were used. It divides the elbow joint dysplasia in 4 grades: grade 0 - no changes, grade I - initial degree of arthritis, grade II - average degree of arthritis, and grade III - advanced degree of arthritis (1). The classification into one of the degrees had been made on the basis of radiographs.

In 32 dogs, the different surgical treatments were used. Based on the diagnosis and degree of degenerative changes, the animals subjected to the treatment were divided into the following groups:
- group I consisted of 10 dogs with grade 0 of arthritis, showing no lameness, in which x-rays showed the problem of radial – ulnar incongruity. Dogs in this group have undergone treatment of dynamic ulnar osteotomy;
- group II consisted of 12 dogs with grade I of arthritis and five dogs with grade II. Dogs in this group were
qualified for surgery of arthrotomy through the collateral medial ligament;
- group III consisted of five dogs with grade II of arthritis, including three dogs with the additional problem of osteochondrosis dissecans (OCD), which were qualified for surgery of arthrotomy with approach through osteotomy of condyle of the humerus;
- group IV consisted of dogs, in which due to their age and severity of degenerative changes (arthritis grade III), only pharmacological treatment with preparation containing the steroid betamethason (Schering Plough, USA) and long-term administration of chondroprotective medications, restriction of movement, and weight control were applied.

Dogs subjected to surgery were premedicated with mixture of medetomidine (ScanVet, Poland) (1-20 mg/kg) and butorphanol (ScanVet, Poland) (0.1-0.2 mg/kg), which was administered in a single intramuscular injection.

The surgery was performed in isoflurane (Baxter, Poland) inhalation anesthesia, with early intravenously induced propofol (Polfa, Poland) at a dose of 1-2 mg/kg. Additionally, brachial plexus blockade was applied using 2% lignocaine (Polfa, Poland). In all operated patients, after surgery the soft dressing was applied for 10-14 d with the recommendation to reduce physical activity. Dogs have been secured for 7-14 d with analgesic and anti-inflammatory medicines containing carprofen (Pfizer, Poland). In all dogs, the mobility control was performed in about 4 and 12 weeks after surgery. This control was performed based on an interview with the owner, clinical examination consisting of orthopedic examination in motion and rest, bending and straightening of the leg, and radiological examination of joints. After completing the examinations, qualifications were made using a four-level scale of postoperative evaluation. Very good scores received dogs, in which lameness was not observed after surgery. Good scores were given to dogs in which lameness after surgery appeared sporadically, usually after a prolonged effort. Sufficient scores, received dogs showing lameness occurring after a long rest and after prolonged exercise. Animals with poor results of the evaluation were limping all the time.

**Results**

Detailed data on the treated dogs are included in the Table 1. Forty-one animals showed improvement in the mobility in control tests. In one dog degree of post-surgery activity was assessed as poor. In group I, during post-surgery control in weeks 4 and 12, a very good degree of mobility in all dogs were observed. In group II (17 dogs) in 12 dogs postoperative performance status at week 4 was evaluated as good, and at week 12 as very good.

These dogs before surgery were eligible for grade I of arthritis. In the remaining five dogs of this group, during the postoperative inspection the degree of mobility was estimated as sufficient at week 4 and good at week 12.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of dogs</th>
<th>Age range (months)</th>
<th>Grade of arthrosis</th>
<th>Treatment</th>
<th>Validation of postsurgery 4 weeks</th>
<th>Validation of postsurgery 12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>10</td>
<td>5-9</td>
<td>0</td>
<td>Dynamic ulnotomy</td>
<td>good</td>
<td>very good</td>
</tr>
<tr>
<td>II</td>
<td>12</td>
<td>10-16</td>
<td>I</td>
<td>Arthrotomy-lig.coll.med.</td>
<td>good</td>
<td>very good</td>
</tr>
<tr>
<td>II</td>
<td>1</td>
<td>15</td>
<td>I</td>
<td>Arthrotomy-lig.coll.med.</td>
<td>sufficient</td>
<td>good</td>
</tr>
<tr>
<td>II</td>
<td>4</td>
<td>14-17</td>
<td>II</td>
<td>Arthrotomy-lig.coll.med.</td>
<td>sufficient</td>
<td>good</td>
</tr>
<tr>
<td>III</td>
<td>1</td>
<td>18</td>
<td>II</td>
<td>Arthrotomy-osteotomy</td>
<td>good</td>
<td>very good</td>
</tr>
<tr>
<td>III</td>
<td>1</td>
<td>18</td>
<td>II</td>
<td>Arthrotomy-osteotomy</td>
<td>good</td>
<td>good</td>
</tr>
<tr>
<td>III</td>
<td>2</td>
<td>15</td>
<td>II+OCD</td>
<td>Arthrotomy-osteotomy</td>
<td>sufficient</td>
<td>good</td>
</tr>
<tr>
<td>III</td>
<td>1</td>
<td>17</td>
<td>II+OCD</td>
<td>Arthrotomy-osteotomy</td>
<td>sufficient</td>
<td>sufficient</td>
</tr>
<tr>
<td>IV</td>
<td>3</td>
<td>19-23</td>
<td>III</td>
<td>Pharmacological</td>
<td>sufficient</td>
<td>good</td>
</tr>
<tr>
<td>IV</td>
<td>3</td>
<td>20-23</td>
<td>III</td>
<td>Pharmacological</td>
<td>sufficient</td>
<td>sufficient</td>
</tr>
<tr>
<td>IV</td>
<td>3</td>
<td>18-19</td>
<td>III+OCD</td>
<td>Pharmacological</td>
<td>sufficient</td>
<td>sufficient</td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
<td>24</td>
<td>III+OCD</td>
<td>Pharmacological</td>
<td>bad</td>
<td>bad</td>
</tr>
</tbody>
</table>

**Table 1**

Evaluation of the post-operative effectiveness taking into account dogs’ age, method of treatment, and degree of degenerative changes
Among them, four dogs showed grade II of arthritis before surgery, and one grade I. In group III, the results were as follows: in one dog (arthritis, grade II), the performance during the inspection was estimated to be good at week 4 and very good at week 12, in three dogs - good at both 4 and 12 weeks. One of them was affected by grade II of arthritis, and in two dogs problem with OCD occurred. In the last dog (II degree + OCD) of the group, the efficiency has been assessed equally as satisfactory in weeks 4 and 12. In group IV, in three dogs, the mobility assessed in week 4 was found to be satisfactory and good in week 12. In six dogs from this group, assessment of mobility, at both 4 and 12 weeks was qualified as sufficient, and in one dog was qualified as bad during both checks.

Control radiographic pictures made at weeks 4 and 12 in group I pointed to the elimination of radial-ulnar incongruity in all dogs. In groups II and III pictures taken during both post-surgery controls showed no significant differences compared with images taken prior to the surgery. By contrast, in group IV, control in week 4 revealed no changes with respect to the state before treatment, and at week 12 the progress of degenerative changes in the elbow joint was observed only in case of one dog.

Discussion

The study showed that the best clinical outcomes occurred in group I, where all the dogs, after about 3 months, obtained very good assessment of the performance after surgery. We believe that it was associated with appropriate early intervention, and thus decommissioning of the radial-ulnar incongruity before it led to the breaking of coronary process and development of degenerative changes in the joint. The worst clinical results were obtained in group IV, which was associated with too late diagnosis and thus limited possibilities for effective intervention.

Elbow dysplasia, particularly fragmented coronary process, is considered by many authors to be the main problem of the thoracic limb lameness in dogs (1, 16, 17). Predisposed to this disease are young dogs, breeds of large and medium size, and fast-growing dogs (9-11), which in our research groups were represented by: Labradors, goldens, Bernese Cattle Dogs, German Shepherds, and Newfoundlands. Temwichitr et al. (17) and Innes et al. (9) added rottweiler to those breeds, and Slatter (16) added mastiff, chow-chow, and the Shar Pei, probably due to the popularity of these breeds in the country.

Danielson et al. (1) questioned the existence of a relationship between fragmented coronary process and osteochondrosis; however our observations indicate that the relationship exists, which was also confirmed by Bennett et al. (2). In addition, Temwichitr et al. (17) have shown that there are several logical theories supporting the coexistence of both pathologies, because they are caused by the same disorder resulting from abnormal development of growing bones. Additionally, our studies demonstrate the possibility of simultaneous occurrence of both diseases, as it was observed in four of our patients.

In case of elbow dysplasia, especially coronary process, the most valuable and recommended methods among the diagnostic imaging are CT and MRI (13, 14). However, our experience shows that the diagnosis is also possible by means of thorough clinical and radiological examinations, which was confirmed in the studies of Hornof et al. (8), and Grondalen et al. (6). By contrast, Cook et al. (4) indicated the general method of imaging as a necessary condition for the correct diagnosis. Very useful diagnostic methods also include arthroscopy. Fitzpatrick et al. (5), Wagner et al. (18), and Punke et al. (12) have proven that the arthroscopic examination reveals changes, which are not detected by X-ray examination. Arthroscopy is considered as the best method to treat fragmented coronary process, which gives a much better clinical outcomes and faster recovery (1). It requires, however, an appropriate equipment and skills, and the person carrying out the procedure should be prepared for the possibility of the forced withdrawal from the procedure and implementation of the classical operation. The results of our study show that very good clinical results can be obtained in the application of conventional treatments, and that the time of intervention is very important, which sometimes enforces the use of specific method.

The operational procedure is recommended as a treatment of choice of fragmented coronary process. The obtained clinical results largely depend on the time of intervention and the stage of degenerative changes. For this reason early diagnosis is so important (8). Appropriately rapid implementation of the adequate treatment greatly increases the chances for the proper functioning of the limb in the future.

In conclusion, detailed orthopedic clinical and radiological examinations are sufficient to bring the correct identification of the fragmented coronary process. Dogs of predisposed breeds, despite the absence of lameness, should be radiologically examined for elbow dysplasia at the age of about 4-6 months. Appropriately rapid implementation of classical surgery or arthroscopic method is the only effective treatment for fragmented medial coronary process in dogs.

References