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Treatment of Distal Radioulnar Synostosis and Growth Deformity in a Dog *

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In this report, the use of autogenous fat tissue and operation technique for a case of synostosis existing with a growth deformity in radius-ulna was determined.

A male mongrel dog (4-y-old) with a growth deformity in it's right forelimb was used. It was observed that there was a valgus deformity in carpal joint and the paw was subjected to an external rotation of 45°. Synostosis was observed in the distal of radius and ulna by radiographic examinations. The synostosis was separated with the operation under general anaesthesia. Cuneiform osteotomy was performed for the deformity in distal radius and transversal osteotomy was made for distal ulna. Autogenous fat tissue harvested in gluteal region was placed between radius and ulna in order to prevent reformation of synostosis. Radial fixation was performed by placing two cross pins through both distal and proximal fragments, and by means of a bone plate and screws. The dog walked normally in the end of first month. It was determined that fracture union was completed in the end of first month, and synostosis did not reformed. Fixation devices were removed at the end of the fourth month.

As a results, cuneiform osteotomy was effective in correction of the deformity of radius and ulna, and usage of autogenous fat tissue was useful in preventing reformation of synostosis.

Key Words: *Growth deformity, synostosis, autogenous fat tissue, dog.*

Bir Köpekte Distal Radioulnar Sinostozis ve Büyüme Deformitesi'nin Sağaltımı

Bu çalışmada radius-ulnasında büyüme deformitesi ile birlikte sinostozis bulunan bir olguda operasyon tekniği ve otojen yağ dokusu kullanımı tanımlandı.

Olguyu sağ ön ekstremitesinde büyüme deformitesi bulunan 4 yaşındaki, erkek, melez bir köpek oluşturdu. Olgunun carpal ekleminde valgus deformitesi bulunmaktaydı ve ayağında 45° eksternal rotasyon gözlendi. Radyografik kontrollerde distal radius ve ulna arasında sinostozis saptandı. Sinostozis genel anestezi altında operasyonla ayrıldı. Distal radiusta deformite için kama osteotomi gerçekleştirildi, distal ulnaya ise transversal osteotomi yapıldı. Gluteal bölgeden alınan otojen yağ dokusu sinostozis'in yeniden oluşumunu engellemek için radius ve ulna arasına yerleştirildi. Radius'un fiksasyonu, distal ve proksimal fragmentlerin her ikisinden de geçen iki adet çapraz pin ve plaka ve vidalar aracılığıyla gerçekleştirildi. Köpek 1. ayın sonunda normal olarak yürümeye başladı. Birinci ayın sonunda kırık kaynaması gerçekleşmişti ve sinostozis'in tekrar şekillenmediği gözlendi. Fiksasyon araçları 4. ayın sonunda uzaklaştırıldı.

Bulgular, radius ve ulna'daki deformitenin düzeltilmesinde kama osteotomisinin, sinostozisin yeniden oluşumunun önlenmesinde de otojen yağ dokusu kullanımının yararlı olduğunu göstermiştir.

Anahtar Kelimeler: *Büyüme deformitesi, sinostozis, otojen yağ dokusu, köpek.*

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Introduction

A well coordinated, synchronous growth of the radius and ulna is needed for the normal development of the distal foreleg in the dog. If the alteration in the growth patterns occurs early in development, the resulting changes are proportionately worse (1). Deformities of the distal foreleg of the dog can be attributed to a variety of etiologies. Trauma, hypertrophic osteodystrophy, nutritional secondary hyperparathyroidism, retarded enchondral ossification of the ulna and genetic causes have been reported (2). The incidence of premature closure or fusion resulting in growth deformities is greatest in the distal ulnar growth plate of dogs (1). Because of its conical shape, the distal ulnar physis commonly undergoes compression when traumatized (3, 4). As the radius continues to grow, it bows away from the ulna. The humeroulnar joint undergoes subluxation, resulting in carpal valgus and external rotation of the paw (1, 5). Application of splint, staple bridging the growth plate, tension band wire, and corrective osteotomies were treatment methods of distal ulnar physeal closure in dogs (5-7). The

* VIII. Ulusal Veteriner Cerrahi Kongresi, Van 2002.

simplest techniques is a segmental ulnar ostectomy, which can easily be performed through a caudal approach to the ulna (8). If bone growth has ceased, definitive correction of ulnar physeal closure is indicated. A predetermined size wedge of bone is removed from the point of maximal deformity (4).

Synostosis is described as common consolidation between the radius-ulna, tibia-fibula, two neighboring ribs, metacarpal and metatarsal bones after fracture (9-14). An abnormal union between the radius and ulna may occur, restricting the synchronous growth of the radius and ulna (1). This restriction is synchronous growth causes supination and pronation in cats and dogs (3). Bridging callus can be resected, and the defect is filled with an autogenous fat graft to prevent reformation in treatment of synostosis (15-17).

In this report, the use of autogenous fat tissue and operation technique for a case of synostosis existing with a growth deformity in radius-ulna in a dog was described.

Case Report

A male mongrel dog (4-y-old) with a growth deformity in it's right forelimb was used. The radiographs of the forelimb in medio-lateral and antero-posterior positions were taken. In the radiographic evaluations it was determined that growth deformity and distal synostosis of radius-ulna (Figure 1A). It was decided to apply ostectomie and separate radius and ulna.

Treatment was performed operatively under general anaesthesia. Distal radial diaphysis was exposed appropriately to surgical rules (8). Synostosis was separated with an osteotome. A wedge of bone was removed from the radius at the point of maximum curvatura using an osteotome and the ulna was severed. The size of the osteotomy was performed can be accurately predetermined by making a tracing of the outline of the deformed bone from radiographs taken pre-operatively. The radius was aligned and immobilized by placing two cross pins through both distal and proximal fragments, and by means of a bone plate and screws. An autogenous fat graft harvested from gluteal region was inserted between the separated radius and ulna in order to prevent reformation of synostosis (Figure 1B, 2A). Operation wound was closed appropriately to routinely. The limb of the dog was supported with a bandage reinforced by plastic cast, and the bandage was kept for a month by renewing every week. Fixation devices were removed at the end of the fourth month.

It was observed that the dog had lameness, and a valgus deformity in right carpal joint and the paw was subjected to an external rotation of 45^{o} in clinical examinations. A restriction in supination and pronation in passive movement was also observed. Together with the distal epiphysis of radius showed angular deformation which thought to be as the result of premature closure of distal ulnar growth plate, synostosis was observed in the distal of radius and ulna in radiographic examinations.

Carpal valgus and external rotation of the paw was disappeared after operation. The dog began to use the limb in the fifteenth day and walked normally and supination and pronation movement were performed easily in passive exercises in the end of first month after operation.

The radiographic examination of the case obtained immediately after surgery showed that deformation of radius was recovered. It was determined that fracture union was completed in the first month, and synostosis did not reformed. Complete recovery was observed at the end of the fourth month (Figure 2B).

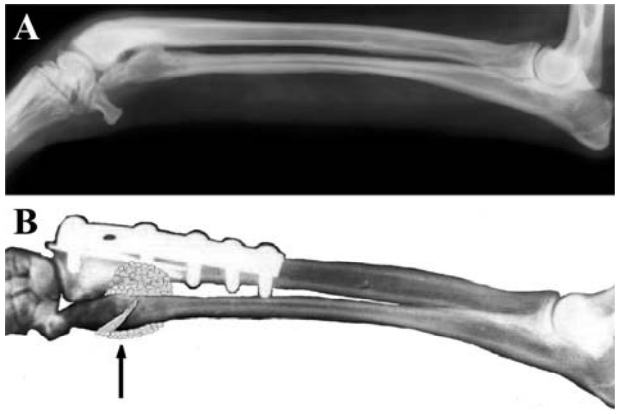

Figure 1. A. Roentgenogram showing angular deformation of radius and synostosis between radius and ulna, **B.** Application of autogenous fat graft (arrow) after synostosis was separated.

Figure 2. A. Roentgenogram showing correction of the angular deformation of radius and ulna, and maintenance of the separation between the radius and ulna. **B.** Roentgenogram of the case obtained at the fourth month post-operation after fixation apparates were removed. Complete recovery is showing.

Discussion

The average age of dogs presented with growth disturbances is five months and therefore it is necessary to consider what can be done to prevent further deformity during the remaining period of growth. The use of plaster

casts or splints to maintain alignment is usually unsuccessful (5). It was noted segmental ulnar osteotomy, stapling and compression wiring are all designed to prevent further deformity and correct angulation of the radius in the growing dog after premature closure or retarded growth has occured at the distal ulnar epiphyseal plate (1, 2, 6).

If the bone growth has ceased, definitive treatment is indicated. The first aim is correction of angular and rotational deformities (7). The cranial shaft of the radius is exposed as described (8), a wedge of bone is removed from the radius at the point of maximum curvatura using an osteotome, and the ulna was severed with bone-cutting forceps. The radius is aligned and immobilized with a bone plate and screws or external skeletal fixator (4, 5).

In the present case, we did not considere plaster casts or splints or stapling and compression wiring with ulnar osteotomy because the dog was mature. The radius was aligned and immobilized by means of a bone plate and screws, and by placing two cross pins through both distal and proximal fragments after a cuneiform osteotomy was performed on the radius, and the rotational deformity was corrected properly to references (1, 2, 5-7). Method of cuneiform osteotomy was sufficent in correction of angular deformation, and performed fixation methods were dependable for maintenance of immobilization.

Synostosis restricts the synchronous growth (3,4), and movement of the radius and ulna (10, 11, 14). If the restriction is important, synostosis has to be severed by performing an operation (9, 12, 13). Some investigators (15, 16), placed autogenous fat tissue between radius and ulna after synostosis was severed to prevent reformation of synostosis. Sachar *et al*. (17) reported that interposition with fat or muscle after severed synostosis, but they noted that synostosis might reform.

In the present case, bridging callus was resected by using an osteotome, and autogenous fat tissue harvested from gluteal region was filled between radius and ulna to prevent reformation. In further controls, it was observed that this application prevented reformation of synostosis and supination and pronation movements were performed easily. The results of the present report showed that cuneiform osteotomy was effective in correction of the deformity of radius and ulna, and usage of autogenous fat tissue was useful tool in preventing reformation of synostosis.

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