Genu Valgum is a deformity affecting giant breed dogs, resulting in "knock knees." The same deformity has been recognized as a growth problem in humans experiencing disproportionate lengthening and rapid periods of growth.

HISTORY
Genu valgum of the dog has been cited in the veterinary literature. The first description of the disease was provided by Stone in 1969(3) This paper was followed rapidly by a report on three dogs by Riser.(1) He described the histologic changes found in the distal femur and provided the first clues to probable etiopathogenesis. Rudy described corrective osteotomy as a method of treatment in 1971.(2) No further literature has been published in the last decade.

ETIOLOGY
The etiology of genu valgum appears to be associated with the rapid growth phase that occurs in giant breed dogs between 4 and 6 months of age. Although the definitive etiology is unknown, the problem appears to be a selective arrest of normal skeletal development.

PATHOGENESIS
The following description of a proposed pathogenesis assists in linking a logical chain of events that results in genu valgum:

1. The rapid growth period of the distal femoral epiphyseal plate and the proximal tibial epiphyseal plate exceeds the metabolic or nutritional supply that local vasculature can provide.
2. Retained endochondral cores indicative of nonmineralization in endochondral bone formation are seen within the lateral femoral condyle (Figs. 56-1 and 56-2).
3. Selectively, growth within the distal lateral femoral condyle and the proximal lateral tibial condyle slows.
4. Normal rate of bone formation and growth continues within the medial femoral and tibial condyles.
5. With increased time the bowing at the knee becomes marked, resulting in a medial bowing of both the femur and tibia. This is recognized as genu valgum.
6. Owing to the medial bowing of the femur and tibia, that is, "knock knees," a lateral patellar subluxation or luxation occurs. (See Fig. 56-5, A)
7. Progressive femoral bowing causes a compensatory coxa valga and anteversion resulting in hip subluxation that may resemble canine hip dysplasia. (See Fig. 56-5, A)
8. As a means of compensating for the abnormal limb bowing, the tarsus progressively rotates laterally resulting in a "cow-hocked" posture.
9. Knee deformity progresses to complete patellar luxation.
10. The deformities within the hip, stifle and tarsus may progress to degenerative joint disease (Fig. 56-3).
11. Disuse of the hind limbs due to deformity and discomfort results in a generalized atrophy of muscles of the rear quarters. The affected animal begins to bear most of its weight on the forequarters and assumes an arched-back posture (Fig. 56-4).

FIG. 56-1 Histologic sections of the distal end of the femur and the proximal end of the tibia of a 3 1/2-month-old Irish Wolfhound. The lateral sides (left) of the metaphyseal areas of the distal femur and proximal tibias are not developing at the same rate as the medial sides. A core of hypertrophic cartilage remains extending proximally into the metaphysis from the growth plate of the femur and downward from the growth plate of the tibia (arrows). The lateral side of the tibia angles downward. The growth plate cartilage has been lengthened on both the medial and lateral sides of the tibia. (Riser, WH, Parkes LJ, Rhodes WH et al: Genu valgum: A stifle deformity of giant dogs. J Am Vet Radiol Soc 10:28, 1969)

FIG. 56-2 The distal epiphyses were removed from macerated femurs of a 3 1/2-month-old Irish Wolfhound (left) and the femur of a 3 1/2-month-old normal dog (right). In the affected dog (left), the lateral prongs of the metaphysis (especially the upper one) were retarded in development. Cores of hypertrophied cartilage had existed in the elliptical grooves of the lateral prongs. (Riser WH, Parkes LJ, Rhodes, WH et al: Genu valgum: A stifle deformity of giant dogs. J Am Vet Radiol Soc 10:28, 1969)


FIG. 56-4 Photograph of a 7-month-old Great Dane exhibiting characteristic hind limb deformities seen in genu valgum.

FIG. 56-5 (A) Cranial-caudal radiograph of both femurs in a 9-month-old Great Dane demonstrates hypertrophy of the medial femoral and tibial condyles, lateral patellar luxation, and coxa valga. (B) Cranial-caudal radiograph of the same animal 3 weeks following femoral diaphyseal varus osteotomy of the left femur, and 5 weeks following femoral diaphyseal varus osteotomy and tibial tuberosity relocation of the left hind limb. (Courtesy of Dr. R. B. Hohn)
DIAGNOSIS
BREED AND AGE PREDISPOSITION
Genu valgum has been recognized in the Great Dane, Irish Wolfhound, and St. Bernard. Most dogs begin to show signs of the disease as early as 5 months of age, but if unrecognized the dog may be seen at a later stage with evident deformities. An equal number of males and females are affected.

HISTORY
Most owners will report that the dog is reluctant to exercise. The animals tire rapidly and exhibit obvious hind limb gait abnormalities.

PHYSICAL EXAMINATION
Most dogs will present with a mild to moderate arched back accentuated by shuffling hindlimb gait caused by the weight-bearing effort of the forelimbs.

Palpation demonstrates the obvious genu valgum accompanied by palpable lateral patellar subluxation and muscle atrophy. Hip subluxation may also be palpable.

RADIOGRAPHY
Radiographic examination may be difficult without sedation or anesthesia owing to the animal's reluctance to extend the stifles fully. Roentgenograms will demonstrate the following:

- Hypertrophy of the medial femoral and tibial condyles, while the lateral femoral and tibial condyles will appear underdeveloped
- Marked medial bowing of the femoral diaphysis and coxa valga
- Lateral patellar luxation
- Degenerative joint disease in the hip, stifle, or tarsus if the problem is chronic (Fig 56-5, A).

Some dogs experience signs for a brief time (during the rapid growth phase). Analgesics and rest and well-balanced nutrition are sufficient treatment, since animals in this group may spontaneously return to normal following the period of accelerated growth.

TREATMENT
MEDICAL
Some dogs experience signs for a brief time (during the rapid growth phase). Analgesics and rest and well-balanced nutrition are sufficient treatment, since animals in this group may spontaneously return to normal following the period of accelerated growth.

SURGICAL
Surgical therapy requires many corrective procedures. It is important to correct the problems at the proper time. This disease progresses throughout the dog's development; therefore, an early corrective procedure may prove ineffective or inadequate as the dog continues to grow.

Most surgeries must correct both the femoral bowing and the tibial tuberosity malposition. Premature correction of the patellar problem will be ineffective, since the problem will recur if the femoral bowing is not corrected as well.

CORRECTIVE FEMORAL OSTEOTOMY
Corrective femoral osteotomy must be planned carefully using the cranial-caudal radiographic views of the femora. The medially based wedge is drawn at the site of maximal femoral bowing. The wedge should be an adequate size to return the distal femur to a position parallel with the walking surface.
Surgery is performed through a standard lateral approach to the femur. Using a hand saw or power equipment, the medially based wedge is removed and the bone ends realigned. Rigid internal fixation is usually provided by bone plate and screws (Fig. 56-5, B).

PATELLAR LUXATION CORRECTION
Repositioning of the lateral patellar luxation is accomplished by medial and lateral arthrotomy incisions on either side of the patella, beginning at the tibial tuberosity and extending proximally to above the patella. Following arthrotomy the tibial tuberosity is osteotomized and relocated medially in a new position, which is aligned properly for the patella to ride in the trochlea. In the chronic luxation, trochlear chondroplasty may be necessary.

Correction of the patellar luxation may be performed simultaneously with femoral osteotomy if necessary (Fig. 56-5, B).

CORRECTIVE HIP OSTEOTOMY
Correction of the apparent coxa valga and anteversion is rarely necessary, since the hip seems to improve following diaphyseal femoral osteotomy. If the hip does not return to normal, varus and derotational osteotomy will correct the coxa valga and anteversion. For details of this technique see Chapter 43, Femoral Osteotomy.

RESULTS
While the results of surgery may be perfect anatomical realignment of joints, the normal muscular structure rarely returns to normal, resulting in atrophied hind quarters and thus continuing gait abnormalities. Surgery is probably the most effective method in preventing progression of degenerative arthritis in the involved joints.

REFERENCES

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