



Luke, a Golden Retriever, developed elbow dysplasia at 18 months.

The Other Dysplasia

A growth disorder of bones in the elbow causes it
by C.C. Holland

It began with a limp so slight it was hardly noticeable. Sue Barns was working with her 18-month-old Golden Retriever, Luke, in a competitive obedience class. They were practicing precise heeling when the instructor pointed out that Luke favored his left foreleg when moving in one direction.

"I hadn't noticed anything before that, and he hadn't had any sort of injury history," said Barns of Los Alamos, N. M. "But over the next week or two, I paid more attention and thought maybe I saw the limp a couple of times."

Although the lameness wasn't an obvious problem, Barns erred on the side of caution and took Luke to the veterinarian for X-rays. He spotted signs that prompted him to forward the films to an orthopedic surgeon. The diagnosis: elbow dysplasia, a

growth disorder of the elbow joint that, if left unchecked, can lead to pain, stiffness and crippling arthritis.

Elbow dysplasia doesn't get the same word of mouth as its better-known cousin, hip dysplasia, but it's as serious and even more complicated, said Karl Kraus, MS, DVM, Professor of Orthopedic Surgery at Tufts University School of Veterinary Medicine.

Another Complexity

"If you compare it to patellar luxation [in which the kneecap slips out of place] or to hip dysplasia, it's another dimension of complexity because it has to do with the way the three bones of the elbow come together," Dr. Kraus said. "Because of that, there's a lot of variability in the manifestation of elbow dysplasia from one patient to the

next and in different degrees of dysplasia, even from breed to breed."

Elbow dysplasia affects primarily large breeds, such as German Shepherd Dogs, Bernese Mountain Dogs, Labrador Retrievers, Golden Retrievers and Rottweilers. It affects the forelegs only – it's sometimes mistakenly believed that dogs have four elbows, but they have only two, says Dr. Kraus. He characterizes the disorder as congenital. It results from what's known as joint incongruity.

It occurs when the three elbow bones – the radius, ulna and humerus – don't develop at the same rate or don't fit together perfectly. The term "dysplasia" itself means abnormal development or growth.

It's difficult to calculate the incidence of elbow dysplasia in the canine population as a whole, said Greg Keller, DVM, chief of veterinary services for the Orthopedic Foundation for Animals, the Columbia, Mo.-based organization that maintains databases and finances research relating to orthopedic and genetic diseases of animals. However, "depending on the breed you're talking about, it's more of a problem in some breeds than even hip dysplasia. The one that comes to mind is the Chow Chow. They list out at No. 1 in affected dogs for elbow dysplasia."

According to the OFA's elbow dysplasia registry, a database of dogs whose owners screened for the disorder through veterinary testing and then registered the results, some smaller breeds – notably, the Cavalier King Charles Spaniel and the Cocker Spaniel – are also prone to elbow dysplasia, albeit to a lesser degree. Dr. Keller cautioned that statistics can be misleading, though, since smaller dogs aren't often seen as candidates for joint issues that



plague their bigger brethren. That means they may have some form of elbow dysplasia, but if they're not screened for it, they won't show up in the registry.

Although the disorder may be diagnosed in one elbow, there's a good chance it's also present bilaterally – that is, in the other foreleg as well. Information from the International Elbow Working

Elbow dysplasia affects primarily large breeds, such as German Shepherds, Bernese Mountain Dogs, Labs and Rottweilers.

Group – a small cadre of canine elbow experts from the USA and Europe who study elbow information and develop screening protocols – showed that a three-year screening of 520 breeding German Shepherd Dogs in France, ages 1 to 6 years, found that fully half the dogs who had elbow dysplasia (about 20 percent) had it bilaterally.

Acts as a Lever

In a functioning elbow, the radius bears most of the weight, while the ulna acts as a lever for the muscles of the elbow joint. It's the ulna that, often pays the price, however, when the joint goes awry. That bone has two features that, in a dysfunctional elbow, can be affected: the coronoid process and the anconeal process, which are bony prominences that bracket the trochlear notch, a shallow curve that cups the end (condyles) of the humerus in the joint (see diagram).

When correct elbow growth doesn't occur, one of three pathologies that characterize elbow dysplasia may occur. First, the anconeal process may fail to fuse to the ulna as it develops and thus becomes free-floating, resulting in a condition known as ununited anconeal process, or UAP. Second,

the medial coronoid process of the ulna may be fragmented, which means either that small particles of the bone break free or that fissures form in the structure. Third, the end of the humerus – in this case, the medial condyle – can become affected with osteochondritis dissecans (OCD). This condition results in damaged cartilage and abnormal cartilage formation,

which can lead to cartilage flaps that detach and float in the joint.

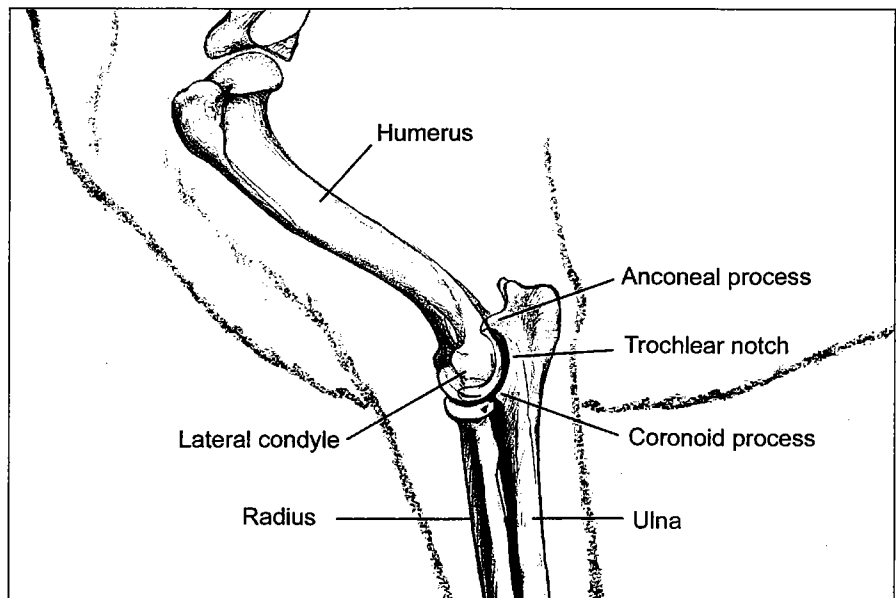
In all three cases, varying degrees of pain, stiffness and lameness in the forelegs can result. Dogs suffering from UAP may develop minor to severe lameness before they're a year old. They may show no signs at all or may develop sudden lameness in middle age. A fragmented coronoid process can show up as subtle limping that progressively worsens. OCD can cause irritation and inflammation in the elbow, as well as intermittent or persistent lameness.

However, because the signs of elbow dysplasia are not necessarily clear-cut, an owner may not suspect a major problem. "It can sort of wax and wane, and be chronic lameness, or it may occur after exercise or periods of inactivity," Dr. Kraus said.

X-rays following a clinical evaluation are the tool of choice for spotting elbow dysplasia. "There are a couple of other subtle little signs you can pick up after you've done this for a while – for example, where they're painful in the joint, the specific character of the crepitation [grittiness when the joint moves]," Dr. Kraus said.

Sometimes, even X-rays can't create certainty. The fragmented coronoid process is notoriously difficult to spot in films. "It's just a little bone on the ulna that tends to get knocked off and turns into fragments," Dr. Kraus said. "You often don't see it radiographically. You look for the secondary signs, such as little osteophytes (abnormal bone growths) or sclerosis (increased bone density) of certain areas."

That's what happened with Sue Barns' dog, Luke. "They speculated it



The Canine Elbow



Pioneering Surgery Replaces Dysfunctional Elbows

Iowa State University made waves in the veterinary world in 2002 with its announcement it had successfully pioneered the first total elbow replacement for dogs. Led by Michael Conzemius, DVM, Ph.D, board-certified by the American College of Veterinary Surgeons, a team implanted replacement elbow joints made of metal — either stainless steel or cobalt chromium — and medical-grade plastic in 20 dogs suffering from osteoarthritis.

Using computerized gait analysis, they monitored the dogs' recovery for one year and found that 80 percent had good or excellent outcomes.

"Although this probably can be improved upon, we consider this successful because these dogs had no treatment options prior to the surgery," Dr. Conzemius said.

The procedure was a long time coming. Although total elbow arthroplasty (TEA), had been used successfully in humans since the mid-1970s, the surgery hadn't

was a fragmented medial coronoid process, which you can't see on an X-ray, but they saw arthritic changes they thought might be indicative of that," Barns said.

The OFA adds another level to the evaluation process by describing three grades for abnormal elbow joints: Grade I, with minimal bone change along the anconeal process (less than 3mm); Grade II, with additional bone proliferation along the anconeal process (3-5mm) and bone changes in the trochlear notch; and Grade III, with well-



The humerus of the prosthetic elbow, top, is made of cobalt chromium. The radial-ulnar component, below, is made from polyethylene.

crossed over into veterinary science until recently. Dr. Conzemius's team refined the implant design and surgical procedure in five years, trying more than 15 different designs before attempting clinical cases.

developed degenerative joint disease and bone proliferation along the anconeal process more than 5mm.

Depending on the degree of affliction, an owner can manage the dog with weight management, rest and anti-inflammatory medication. Lameness may occur after hard exercise, so often an altered exercise program must be implemented. In addition, jumping must be curtailed.

However, especially with younger animals, surgery as soon as possible after diagnosis may be the best option. If fragments float in the joint, severe arthritis can result.

"The elbow is a complex joint," Dr. Conzemius said. "It's a three-bone system and everything has to meet up perfectly or the dog ends up with instability, pain or uneven wear of the cartilage in the joint." Dr. Conzemius' team ended up with a two-part prosthetic in which the humeral component is made of cobalt chromium, while the radial ulnar component is made from ultra-high molecular weight polyethylene — standard medical materials for replacement joints, he said.

The surgery is performed almost exclusively at ISU by Dr. Conzemius. Despite a great deal of public interest, he's done only about 40 TEAs.

"I get a call or e-mail maybe every other day, and I would say the three greatest limitations are travel to Iowa State University, the cost of the procedure — which runs about \$3,500 — and prognosis," he said.

"I suggest that there's an 80-85 percent chance that there'll be an outcome that everybody's happy with, but that means one out of five dogs won't do so well."

If a dog has bad elbow dysplasia, he can end up with end-stage, debilitating osteoarthritis, Dr. Kraus said. "I don't see a lot of it, but when it happens, there's not a lot you can do."

Surgical intervention includes arthroscopy, which allows the surgeon to remove floating bits of bone or cartilage through a tiny hole, where an incision is made into the joint. The result varies.

If the main problem was incongruity in growth, a veterinarian really hasn't done very much except taken a pebble out of the shoe, Dr.



Kraus said. "However, if the growth is congruous, the effect is like removing a huge rock."

Another approach is the ulnar osteotomy – cutting the ulna – in the case of an ununited anconeal process, in the hope that, by relieving stress in the elbow, the anconeal process may be able to unite to the ulna in a normal fashion.

Corrective osteotomies are the new thing, said Dr. Kraus. Surgeons at the University of California-Davis School of Veterinary Medicine are developing a process called corrective humeral osteotomy – cutting and shaping the humerus, or main foreleg bone – in an effort to balance out the elbow joint; because these procedures are new and don't have a lot of data behind them, Tufts doesn't do them yet.

More options are on the horizon. Orthopedic specialist Michael Conzemius, DVM, Associate Professor of Veterinary Clinical Sciences at Iowa State University, has developed the first total-elbow replacement joint for dogs (see sidebar). It may offer hope to dogs

who might otherwise fall victim to crippling arthritis after unsuccessful surgery to correct elbow dysplasia.

The prognosis after surgery can range from excellent to poor, depending on the dog's original condition. Dr. Kraus estimates that, after he performs arthroscopic surgery, about one-third of his canine patients return to normal walking, one-third show improvement but don't return to normal, and the remainder show no improvement.

Did Research

After Luke's diagnosis, Barns consulted his veterinarian and the orthopedic surgeon and did Internet research. She decided on surgery although Luke was almost completely functional.

"It was apparent to me that, if this was what they thought it was, arthritis was going to be the ultimate outcome," she said. "Taking out the chips would slow down the process."

After tests confirmed elbow dysplasia in both forelegs, Luke underwent two arthroscopic surgeries to remove fragments and clean up

damaged cartilage. "It was remarkable how minor it was," Barns said. "He had two tiny little pinpricks like snakebites on either elbow and a terrible shave job, but that was it."

The cost of arthroscopy varies, with surgery on one elbow starting at about \$1,500 and on two from \$1,800 to \$2,500.

Luke's recovery was exceptional – he was back to near-normal three weeks later. Now 6 years old and a search-and-rescue dog, he has also competed in obedience and trained as a hunting retriever. At the recommendation of the surgeon, Barns gives him a glucosamine/chondroitin supplement to help stave off arthritis, but Luke hasn't had a problem since his surgery.

"He works hard and plays hard, so that's been very successful," Barns said. "I'm grateful we caught it early and very grateful to that instructor who first spotted the problem."

C.C. Holland is a free-lance writer in Oakland, Calif.

The Breeds Reporting The Greatest Incidence

The Orthopedic Foundation for Animals maintains databases of heritable diseases to help reduce their incidence. The databases list dogs whose owners have had them screened by veterinarians for a variety of problems, including patellar luxation and hip dysplasia.

According to the OFA's official registry, the chart at the right lists the rank of breeds reporting the greatest percentage of elbow dysplasia between January 1974 and December 2003. For more information, visit www.offa.com or call (573) 442-0418.

	Breed	# of Evaluations	% Dysplastic
1	Chow Chow	302	45.7
2	Rottweiler	7,921	41.3
3	Bernese Mountain Dog	5,061	30.1
4	Chinese Shar-Pei	157	27.4
5	Newfoundland	2,876	26.3
6	Fila Brasileiro	123	20.3
7	German Shepherd Dog	19,792	19.8
8	American Bulldog	139	80.6
9	American Staffordshire Terrier	218	16.5
10	Bloodhound	543	16.0
11	English Setter	1,303	16.0
12	Mastiff	3,044	15.5
13	Bullmastiff	1,110	14.1
14	English Springer Spaniel	526	13.7
15	Australian Cattle Dog	230	13.5
16	Greater Swiss Mountain Dog	868	13.0
17	Labrador Retriever	24,090	12.0
18	Gordon Setter	57	11.7
19	Golden Retriever	9,630	11.6
20	Irish Wolfhound	192	10.9