SCHROEDER-THOMAS SPLINT
The Schroeder-Thomas splint became popular after Schroeder, working at the Angell Memorial Animal Hospital, reported on its use in the early 1930s.\(^4\) The splint was modified from its use in humans to more adequately fit the shape and conformation of the dog. The splint itself is a traction device that has proved useful in the treatment of fractures in small animals. The indications for the splint have changed considerably over the years but initially were quite broad. As better methods of fracture care were introduced, the indications for the Schroeder-Thomas splint became more limited. The improper use of the Schroeder-Thomas splint, resulting in nonunion of the fracture or joint stiffness (fracture disease), has given the device a poor reputation. In fact, application of the Schroeder-Thomas splint has been discontinued in some institutions because of poor results usually related to improper use. If properly fitted for suitable indications, the Schroeder-Thomas splint still represents an excellent tool for immobilization of fractures and in immobilization of joints following other surgical procedures. To optimally utilize this device it must be custom-made for each patient and requires constant attention and adjustment.

As stated above, the Schroeder-Thomas splint is a traction device. The splint is designed so that soft bandages (combine roll) are used as slings to properly position and counteract muscle forces to help align and immobilize parts of the skeleton. On occasion skin traction can be augmented with skeletal traction by using a transfixation pin. This is most commonly done at the stifle or the elbow joint. Here a pin is inserted through the condyles of the distal humerus or distal femur and traction is applied to the pins to control the distal fragment with a Schroeder-Thomas splint.

INDICATIONS
The Schroeder-Thomas splint can be used to immobilize any fracture distal to the midfemur or midhumerus. It is also a useful device for immobilization of joints distal to and including the knee and distal to and including the elbow. The indications for use of this splint can be extended in the hands of some veterinarians but to do so requires constant and careful supervision of the animal and its splint.

CONSTRUCTION
The Schroeder-Thomas splint is custom-made to each animal, and its shape changes in relation to the extremity injured and the purpose for which the splint is designed. In the hind leg the Schroeder-Thomas splint can be useful in immobilizing distal femoral or tibial fractures. Because most femoral fractures are usually stabilized by other means, the construction of the Schroeder-Thomas splint will be described for use in tibial fractures.

To make a Schroeder-Thomas splint it is necessary to have adequate supplies of material to complete the job. The frame of the splint is made of aluminum rods available in a variety of diameters. This external frame should be sufficiently stiff that it will not bend and deform when used by the animal in an appropriate manner. For the average 30- to 40-pound dog, a 6 foot, 3/8 in. diameter aluminum rod is used. The first important component to manufacture for the splint is
the upper ring, which encompasses the thigh. The diameter of this ring can be determined by measuring the distance between the tip of the wing of the ilium and the point of the ischium. The ring should be constructed in a round fashion, which can usually be done by fashioning the rod around an appropriate mold. These molds are available commercially or can be made in a large variety of sizes by using round wooden circles of 3/4 in diameter wood bolted together in sequence. Once the ring has been fashioned, the splint should be fitted to the animal. By lifting the leg it can be seen that the round splint will not conform to the medial side in the groin area. It is important, therefore, to bend the ring in an approximately 45° angle and flatten the ring so that it will conform to the dog's body. To do this, the lower portion of the ring is placed in a vice, and the bend is made approximately half way up the cranial border of the ring and approximately 1/3 of the way up the caudal border of the ring. This portion of the ring is then flattened and padded. Very little padding is needed. Tape is usually applied to the ring so that the sticky side is facing outward and a thin strip of cotton padding is wrapped around the tape. The tape is then reversed and the cotton is covered to protect it from becoming soiled and moist. The length of the Schroeder-Thomas splint is determined by the posterior member. While placing the dog's leg in a normal standing position, a right-angle bend is made at the distal end of the splint approximately 1 inch longer than the length of the dog's leg. It is important not to hyperextend the dog's leg when making this measurement; it should be in a normal position so that the splint will not be too long for the dog when walking. Since the Schroeder-Thomas splint is a traction device, it is important that its width be sufficient to allow traction of the individual members of the leg so that they will not contact the device itself. Bending of the bar in the cranial surface of the Schroeder-Thomas splint would be at the level of the knee and again at the level of the hock. It is important that this be done in a way that allows the padding to be appropriately placed. Following construction of the splint, the outside of the aluminum frame is covered with adhesive tape to prevent slippage of the traction slings before they are applied (Fig. 15-7). Combine roll is the usual choice of material for slinging the leg after fastening the distal end of the foot to the end of the splint by means of a taped stirrup. It is important that this tape be well fastened to the dog's foot because this is all that secures the splint to the dog's leg. It is equally important in application of the tape that no tape be placed in a circumferential manner that would cause constriction of the dog's foot and toes, possibly resulting in swelling or loss of vascularity and sloughing of the foot.

FIG. 15-7 A pelvic limb Schroeder-Thomas splint. The finished splint is shown with flattened tilted groin bar. Tape is applied to keep the traction members from slipping.
Following the application of the splint to the dog's foot by the cranial and caudal strips of tape, the hock joint is stabilized with the first band of combine roll, which is approximately the length of this splint. The combine roll is looped over the posterior aspect of the bar underneath or medial to the tarsus and the entire roll is brought around laterally so that the hock is pulled back into position. The hock is brought back so it touches the metal bar. The combine roll is continued around through the splint to provide medial support and is then pulled to tension and secured with tape (Fig. 15-8, A). At this point reduction of the fracture is accomplished and a second piece of combine roll, which is approximately 1 1/2 to 2 times the length of the splint, is used to secure the femur in a cranial position in relation to the splint (Fig. 15-8, B). In this case the
procedure followed at the distal hock is repeated in reverse so that the femur is pulled forward to
the bar, but after the combine roll has passed through the splint it then provides medial support to
the tibial area by constant figure-of-eight motions within the splint (Fig. 15-8, C). Following
tightening of the combine roll and taping it in place, the fracture is checked for stability. It is
important that the ring of the Schroeder-Thomas splint be in contact with the groin area and not
allow motion at the fracture site. Depending on the swelling that is present, it may be necessary
to adjust the splint the following day and every three or four days thereafter.

When applying the Schroeder-Thomas splint to the hind leg, it is important to know for what
purpose it is being applied. The shape of the splint is basically the same for any area, but traction
should always be applied to the bone that is fractured or requires immobilization. The traction
itself will not displace the fracture but will provide adequate tension on the already contracted
musculature, thereby providing stability at the fracture site. When applying a Schroeder-Thomas
splint for fracture of the tibia, the bands should go around the hock joint first and then above the
tibial area to provide traction of the tibia. If, in fact, the fracture is of the femur, the bands
should go around the hock joint and then around the proximal tibia or distal femur to provide
stability and traction in the femur. The traction exerted in the femur is provided between the bar
under the groin and the uppermost traction band. Anytime a fracture is stabilized by means of a
Schroeder-Thomas splint, valgus deformity is a possible complication unless care is taken to use
medial support both in the tibia and femur when applying the second combine roll. The combine
roll should always be directed at providing medial support to the fracture in question (Fig. 15-8,
C). When applying a Schroeder-Thomas splint to the hind limb for fractures of the femur, it must
be remembered that the proximal fragment of the femur will be in external rotation because of
the pull of the iliopsoas muscle on the lesser trochanter. It is therefore imperative that the distal
portion of the femur and the distal extremity be positioned in external rotation also. This will
allow both the proximal and distal fragments to heal in external rotation, producing a straight leg.
If, in fact, the distal fragment is held in its normal position with the leg in a normal position, the
proximal fragment will rotate externally. This will result in a severe internal rotation deformity
upon healing and a gait abnormality. When dealing with a femoral fracture, it is of utmost
importance that care be taken to externally rotate the distal fragment in the first positional wrap.

FIG. 15-8 Application of a Schroeder-Thomas splint. (A) The bottom sling is placed first, as
shown. Following completion, the combine roll material is taped in place. (B) The process is
reversed to apply the top combine roll to pull the femur forward, thereby applying traction to the
tibia. (C) Medial support is applied to the tibia by continuation of the bandage medial to the tibia.
In femoral fractures it is common for the Schroeder-Thomas splint to change its shape slightly,
becoming wider across its midsection. This will allow the femur and tibia to be at approximately
a 90° angle at the knee joint, thus permitting the bands to be applied to the tibia and thereby
provide traction to the femur. If a larger angle is created between the femur and tibia (>90°), the
bands may tend to slip down the tibia, providing inadequate immobilization of the fracture.

When completed, the Schroeder-Thomas splint may be covered by an elastic stockinette. This
will help to prevent the animal from chewing on the device, as well as protect the device from
being caught by projecting objects. However, covering the limb in such a way may make it difficult to determine if swelling has occurred. The basic method for checking swelling is to feel between the deep flexor tendons and the gastrocnemius muscle just above the point of the hock. If swelling has occurred here, the Schroeder-Thomas splint should be checked by careful observation and/or changing. Swelling should not be allowed to occur to a greater extent than mild pitting edema of approximately 2 days duration. Sometimes considerable edema is present at the time of splinting; if so, allowances must be made for this.

This Schroeder-Thomas splint applied on the front leg looks considerably different than on the back leg. The use of the Schroeder-Thomas on the front leg for distal humeral fractures, elbow fractures, or radial and ulnar fractures may allow for considerable change in the form that the splint takes. For midshaft humeral fractures, which are about the upper limit for use of this device, the splint will be relatively straight (Fig. 15-9). As the fracture becomes more distal, the positional shape of the splint will become more and more that of a right angle (Fig. 15-10) as the result of the relationship of the fractured fragments to the pull of the muscles that surround them. For midshaft fractures, direct traction on the leg will help reduce and immobilize the fracture fragments. When fractures occur at the distal end of the humerus, the extensors of the carpus and forepaw will rotate the distal fragment cranially. In this instance traction on the leg will produce a malalignment of the fractured humerus. The Schroeder-Thomas splint is made at a 90° angle, thereby allowing the fracture ends to be united in a more normal fashion. To make a Schroeder-Thomas splint for the front leg, the size of the ring is usually determined by the length of the scapular spine. The ring is flattened considerably into a large oval, and the distal aspect of the ring is bent medially to a 30° to 45° angle with the oval (see Fig. 15-9). The splint is padded, as it is in the back leg, and then bent according to the shape of the fracture. When bending the splint to the required shape it is important to seat the splint closely under the axilla while putting the elbow distally. The caudal bar of the splint should be bent at the elbow approximately 1 to 2 inches beyond the distal aspect of the elbow, and the cranial bar bent proximally 1 to 2 inches proximal to the elbow joint. This can be either a gentle bend, as in a midshaft fracture, or a right-angle bend, as in a distal humeral fracture (see Fig. 15-10). The length of the splint is determined by extending the leg in a relaxed manner so that the end of the splint will coincide with the end of the toe when extended to the splint. The foot is attached to the splint in the same manner as described for the hind foot, using tape on the cranial and caudal aspect of the paw. In the front leg, the wraps (combine roll) are applied first at the level of the elbow, pulling the humerus backward, and second at the level of the carpus, pulling it forward. This allows for a leverage effect that can increase the tension in the radius, ulna, or humerus when the second wrap is applied (see Fig. 15-10). Following the wraps the Schroeder-Thomas splint can be covered again with a stockinette. Adjustments are provided on the same time schedule as with the hind-leg Schroeder-Thomas splint.

FIG. 15-9 The front-leg Schroeder-Thomas splint would assume this shape for a midhumeral fracture.
FIG. 15-10 A right-angled Schroeder-Thomas splint. The first combine roll traction bandage is applied to the elbow region (1). The second traction bandage uses the first as a fulcrum and applies additional gentle traction to the humerus (2).