Basic Athletic Training
Course Pack A

CHAPTER

4

Protective Taping and Wrapping

sportpoint / Shutterstock.com

STUDENT OUTCOMES

1. Identify uses of prophylactic tape and wraps in the management of musculoskeletal injuries.
2. Explain common principles used in the application of tape and wraps.
3. Identify characteristics of materials in protective taping and wrapping design.
4. Describe common taping and wrapping techniques used to prevent or reduce the risk of reinjury.
5. Differentiate between standard techniques for protective taping, McConnell taping, cohesive system taping, and Kinesio Taping techniques.

INTRODUCTION

Taping or wrapping a body part can provide support and prophylactic protection to prevent injury while allowing functional movement and is used extensively during rehabilitation to reduce the risk of reinjury. Providing support to an injured body part may allow for an early return to activity while controlling undesirable movement that may impede the healing process. No matter the technique utilized, each taping must be customized based on the particular patient and condition being treated.

In this chapter, the general principles of taping and wrapping are covered followed by information on the various types of tape and wrapping materials currently available. Techniques that serve as the building blocks common to many different types of taping applications are covered within this chapter. More recent taping techniques, such as cohesive taping systems and Kinesio Taping will also be discussed in more detail in the final section of this chapter.

PRINCIPLES OF TAPING AND WRAPPING

As a prophylactic measure, a basketball player with a history of lateral ankle sprains is taped to reduce the risk of reinjury. What is the procedure for removing the tape?

Tape and wraps are devices used to:

1. Provide immediate first aid
2. Limit excessive joint movement
3. Support an injured body part
4. Provide compression
5. Provide proprioceptive feedback
6. Secure protective pads and dressings

7. Allow early resumption of activity
8. Reduce the chance of reinjury

There are two ways the application of tape assists in preventing reinjury of the tissues that stabilize joints. First, tape limits range of motion and provides additional external stabilization by acting as an external ligament. Second, tape enhances the stability of the joint through increasing joint **proprioception**. However, due to elongation and stretching, tape has been found to lose much of its supportive properties after about 20 minutes of activity.[1,2] Therefore, an injury must be fully evaluated to determine the pathology and severity and phase of healing to determine the appropriate technique and type of tape to utilize. Injured anatomical structures must be identified, and an appropriate therapeutic rehabilitation program should be developed to ensure a safe return to activity. Too often, a premature return to activity can lead to reinjury or a chronic injury. Although tape and wraps may allow the individual to resume early activity, their use should never take the place of a comprehensive rehabilitation program. Only those individuals who are participating in a supervised therapeutic exercise program should be taped or wrapped.

A rehabilitation program, as discussed in a later chapter, should focus on regaining full range of motion, proprioception, strength, endurance, and power in the injured body part while maintaining cardiovascular fitness. The individual should be able to complete, pain-free, all functional tests before being cleared for participation. In each phase of activity, the correct taping or wrapping technique should be selected and properly applied. It is also important to note that when improperly or poorly applied, a taping or wrapping technique can cause damage, including blisters or skin irritation, abnormal stress on body parts, and increased risk of injury to the region. Taping should not be applied if the injury assessment is not adequate or incomplete, the diagnosis is unknown, there is joint instability or a possible fracture, or if there is swelling or irritated skin.[3]

Tape and Wraps

With so many options available, selecting and purchasing taping products may

be overwhelming. Factors such as color, width, strength, adherent properties, and tape quality go in to the decision-making process.

Makeup of Tape

Tape is described using four identifiers: *threads per square inch*, *tensile strength*, *composition*, *and adhesive mass*.[4]

Threads per Square Inch

The number of vertical **threads per square inch** is referred to as warp, whereas horizontal threads per square inch are the woof. Less expensive, lighter tape contains 45 vertical fibers and 65 or fewer horizontal fibers per inch. Heavier tape contains 65 vertical fibers and 85 or more horizontal fibers.[3] Although tape is subjected to shear, tensile, flexure, and peel forces, ultimately, it is the tensile strength that is most important to consider.[5]

Tensile Strength

Tensile strength is the measurement of how much tensile force a material can withstand before it fails. Manufacturers of athletic tape assess tensile strength in accordance with industry standards and report tensile strength as pounds per square inch. The higher the pounds per square inch, the stronger the tensile force or strength is of the tape.[4]

Composition

Composition refers to the materials that are used to make the tape. In general, athletic tape is made primarily of cotton, synthetic fibers, or in combination.[4] Tape may be elastic or nonelastic. Elastic tape is used to hold protective pads and dressings in place, provide compression, give proprioceptive feedback, and provide support. One advantage of elastic tape is that it allows muscles to contract without impeding circulation or neurological function. The level of elasticity in tape varies from brand to brand—the more elastic the tape, the easier the application. Elastic tape should be stretched to between one-third and one-half of its elastic capability before application. If it is applied too tightly, the tape can restrict circulation and function of the body part, leading to

increased pain or discomfort. Products come in a variety of widths and tensile strengths. A product must be selected according to the pathology of the injury and the desired effect. Nonelastic tape provides support to joints by restricting excessive motions.

The composition of tape may also be designed to produce tapes that are porous or nonporous. Porous tape, primarily made of synthetic fibers, allows heat and sweat to pass through minute openings in the tape, which allows the skin to remain cool while also permitting the tape itself to remain dry and to maintain its properties longer.[5] Nonporous tape, primarily made from cotton, makes the application more occlusive, thus increasing the potential for damage to the underlying skin from friction and retained heat. Nonporous tape will absorb the sweat and may result in decreased tape performance.[5] Like elastic tape, nonelastic tape comes in a variety of widths, primarily ranging from 0.5 to 3.0 in.

Tape may be bleached or unbleached. Bleached tape tends to be more aesthetically pleasing, but it is more expensive and does not offer better support compared with unbleached tape.[4] Nonelastic tape is more difficult to apply than elastic tape. The body's natural contours increase the potential for wrinkles and excessive pressure from friction on underlying tissues, which can lead to blisters or cuts under the tape if it is applied incorrectly. An effective, wrinkle-free, nonelastic taping technique requires extensive practice and patience.

Adhesive Mass

The final identifier used to describe tape is **adhesive mass** or stickiness. Zinc oxide adhesive is utilized in making athletic tape and assists in keeping the tape in place. Some people may be allergic to the adhesive or other materials found within the tape, and it is important to always question the patient regarding allergies before applying tape.[1]

Types of Tape

Different types of tapes can be categorized based on overall tensile strength with underwrap being the absolute weakness moving to the nontearable tapes

being the strongest.[5] It is important to note that tensile strength can vary within each category depending on the product. Known tensile strengths are presented in Table 4.1.

TABLE 4.1 Known Tensile Strength

TEARABLE STRETCH	COHESIVE TEARABLE	ATHLETIC TAPE	NONTEARABLE SPECIALTY TAPE
		COACH[a] (36 psi)	
		ZONAS[a] (38 psi)	
PowerFAST[b] (23 psi)	PowerFlex[b] (23 psi)		
	PowerSpeed[b] (32 psi)		
	VictoryTape[b] (37 psi)		
	PowerTape[b] (41 psi)		

[a]COACH and ZONAS are trademark products of the Johnson & Johnson Sports Medicine. Data was collected from Andover Healthcare Department of Sports Medicine Education, Research, and Development.
[b]PowerFAST, PowerFlex, PowerSpeed, VictoryTape, and PowerTape are Andover Healthcare, Inc. products, and data on tensile strength was collected directly from Andover Healthcare Department of Sports Medicine Education, Research, and Development.

Underwrap

The only product found in the "weakest category" is underwrap, which is also referred to as prewrap. Prewrap is a pressed foam rubber. Prewrap has less than 1 lb of tensile strength and acts as a protective layer. In order to keep the prewrap in place, an adhesive spray needs to be applied to the skin first. The prewrap is then laid down, followed by the application of tape. Again, it is important to check with the patient to see if he or she has allergies to the chemicals contained within the spray.[1]

Stretch Tearable Tape

The second category is stretch tearable tape. Made out of cloth adhesive material that stretches, tearable tape is used to keep pads in place and stimulate proprioception but will do little to limit range of motion.[5] Termed "tearable" because the material can be ripped by hand, scissors are not needed to cut the tearable tape. Tensile strength of tearable tape varies and is a factor that should be considered in light of the goal of the taping technique selected.

Cohesive Tearable Tape

In the middle of the strength spectrum is cohesive or self-adhesive tearable tape. Made of synthetic material, cohesive tape is designed to adhere to itself,

sweat-resistant, and breathable.[5] An advantage of cohesive tape is that the application of tape adherent sprays and underwrap can be eliminated. Tensile strength of cohesive tearable tape varies from product to product.

Athletic Tearable Tape

Many different manufacturers make the white tearable tape that is instantly recognizable as "athletic tape." Although the most common color is white, athletic tape comes in many different colors and is made out of cotton or synthetic fibers. Tensile strength varies by manufacturer, and different grades/strengths of tearable tape are offered within product lines. The use of spray tape adherent and prewrap is needed when using cotton athletic tape. All cotton athletic tape, regardless of the manufacturer, is nonporous. The combination of the underwrap and nonporous nature of cotton tape can result in the taping technique becoming wet as it absorbs the athlete's sweat. When wet, the material stretches and, in some ranges of motion, loses some of the stabilizing properties provided by the initial taping technique.[1,2,5,6] Synthetic athletic tape is porous and does not become wet and therefore can maintain much of the stabilizing properties provided by the initial taping technique.[6]

Nontearable Tape

Tape that cannot be torn with the fingers is classified as nontearable. Also known as specialty tape, there is a wide range of tape within this category such as moleskin, ELASTIKON, Leukotape, Jaystrap, and Kinesio tape. Nontearable tape has the strongest tensile strength.

Wraps

All cloth elastic wraps contain fibers that allow it to be stretched. Elastic wraps can be used to secure pads and dressings, provide compression and support, and give proprioceptive feedback. These wraps are typically secured in place with metal clips or tape. A special type of elastic wrap, called a **cohesive elastic bandage**, is composed of two layers of rayon separated by spandex and is designed to make the material adhere to itself eliminating the need for adhesive tape or metal clips to prevent slippage. Like stretch tape,

elastic wrap should be stretched to between one-third and one-half of its elastic capability before application. If it is applied too tightly, the wrap can restrict circulation and function of the body part, leading to increased pain or discomfort. Products come in a variety of widths and tensile strengths. A product must be selected according to the pathology of the injury and the desired effect.

Application of Tape

The body part should be clean, dry, and free of hair before application. Hair should be removed with an electric shaver or disposable razor. Any minor open wounds, such as blisters or cuts, should be cleaned with normal saline and covered with a sterile dressing. Areas sensitive to friction, such as the Achilles tendon or dorsum of the foot, should be protected with a pad and lubricant. Petroleum jelly or a commercial skin lubricant may be applied to a gauze or foam pad.

Unless the specific technique being applied requires the body part being taped to be placed in a specific position, the body part is usually taped in a **functional position**. For example, when applying a hip spica, the patient is required to stand on a table with the hip and knee placed in slight flexion, which is a functional position for the hip. This position is accomplished by placing the patient's heel on a 1.5- to 2.0-in heel lift. Old tape cores wound with tape or a commercial taping block may be used. Tape rolls, even those of the appropriate height, compress and become unusable over time.

When the skin has been prepared appropriately, a light layer of tape adherent is sprayed onto the skin surface and allowed to dry. This provides a sticky surface permitting the tape to adhere better to the skin and provides a layer of protection for the skin. For individuals who are sensitive to tape, are taped on a daily basis, or are allergic to tape, a single layer of foam underwrap may be applied over the skin before tape application. It is critical that only one layer of underwrap be applied because several layers may increase sweating under the tape and, in doing so, compromise the effectiveness of the taping technique.

Proper positioning of the athletic trainer is as important as proper positioning of the patient. To avoid unnecessary low back stress, a table of an appropriate height should be used to prevent excessive bending at the waist. If it is necessary to reach above shoulder level, the athletic trainer should stand on a bench or the patient should be seated. When several dozen patients must be taped in a short amount of time, proper positioning is critical to prevent overtiring of the athletic trainer.

To avoid wrinkles in the tape, only a few inches of tape should be unrolled at one time. As the tape is guided around the contours of the body part, slight tension should be applied. In tearing the tape, the roll should be held in one hand and pinched between the thumb and index finger of each hand (Fig. 4.1). A quick push of the roll away from the body while holding one hand still results in the tape ends being evenly torn.

Figure 4.1. Tearing tape. Hold the tape roll in the dominant hand. Pinch the tear site with the index finger and thumb of both hands. Hold the nondominant hand still as the dominant hand pushes the roll quickly away from the body.

In most taping techniques, each subsequent strip of tape should overlap the previous strip by one-half to one-third the width of the tape. The tape should be applied snugly but without impairing circulation. Circulation can be assessed by taking a pulse distal to the tape application, feeling for skin temperature, or blanching the nails to check capillary refill. Skin color and temperature should be the same bilaterally above and below the taping. Following the application of the tape, the patient should check the body part

for support and function.

Removal of Tape

Because prolonged contact with the skin may cause tissue breakdown and bacteria formation, tape should be removed immediately after activity. The tip of the tape cutters or scissors can be dipped in a skin lubricant to facilitate removing the tape from the skin. The scissors or tape cutter should lift the tape up and away from the skin and then advance along the body's natural contours (**Fig. 4.2**). For example, with an injury to the lateral aspect of the ankle, the initial position of the tape cutter is the posteromedial aspect of the tape application. Next, the cutter is moved distally around the posteromedial malleolus, extending through the arch toward the toes. In this manner, the tape cutter or scissors does not place any undue pressure on sensitive, injured structures. In removing the tape, the skin must be stabilized while the tape is pulled in the direction of the natural hair growth. Tearing tape rapidly off the skin can lead to damaged skin, open wounds, and pain. Following the removal of the tape, the skin should be cleansed with a de-adhesive and then washed with soap and water and dried thoroughly. In addition, a skin moisturizer should be applied to prevent skin dryness and breakdown. **Application Strategy 4.1** summarizes application techniques for taping a body part.

Figure 4.2. Removing tape. Lift the tape away from the skin and advance the scissors or tape cutters along the body's natural contours, avoiding sensitive tissues.

APPLICATION STRATEGY 4.1

Application Techniques for Taping a Body Part

Prior to Application

- First check with patient for allergies to any materials used in the taping technique.
- The body part should be clean, dry, and free of hair.
- Cover open wounds with a sterile dressing.
- Apply a lubricated pad over sensitive areas, such as the dorsum of the foot, Achilles tendon, or popliteal space.
- Spray a light layer of tape adherent onto the skin surface.
- For individuals sensitive or allergic to tape, or who must be taped on a daily basis, apply a single layer of foam underwrap.

During Application

- Use a table at an appropriate height to minimize the low back stress of the athletic trainer.
- Should it be necessary to reach above the shoulder level, the athletic trainer should stand on a bench or the patient should be seated.

- Place the body part to be taped in a position of function to ensure the desired result.
- If the hip and knee must be slightly flexed, place the heel on a 1.5- to 2.0-in heel lift.
- Unroll only a few inches of tape at one time as a way to prevent wrinkles.
- Guide the tape around the contours of the body part while applying slight tension.
- Each strip of tape should overlap the previous strip by one-half to one-third the width of the tape.
- When completed, check circulation.

After Participation in Activity

- Remove the tape immediately to prevent skin breakdown.
- Dip the tip of the tape cutters or scissors in a skin lubricant, lift the tape up away from the skin, and cut along the body's natural contours.
- Always cut on the side opposite the injury site.
- Remove the tape in the direction of the natural hair growth.
- Cleanse the skin with tape remover and then soap and water. Dry thoroughly.
- Apply a skin moisturizer to prevent dry skin.
- Inspect the skin regularly for signs of irritation, blisters, or infection.

The skin should be inspected regularly for signs of irritation, blisters, or infection, including areas that are red, dry, hot, and tender. These signs indicate a possible allergic reaction to the tape or tape adherent. If the skin cannot be protected from irritation, it may be necessary to fit the patient with an appropriate commercial brace rather than risk continued irritation.

Application of Wraps

The application of elastic wraps should begin with the body part in a position of maximum muscle contraction. This ensures that movement and circulation

are not impaired during activity. A wrap should be started distal to the injury site and continue to the area proximal to the injury. This prevents any edema formation from settling in the distal digits and provides support against gravitational forces. The wrap should be stretched from one-half to one-third of its total elastic capability before application. Excessive stretching may constrict circulation, compress superficial nerves, and impair function. Each turn of the wrap should overlap at least one-half of the previous, underlying strip. The end of the wrap may be secured with elastic tape for added support. **Application Strategy 4.2** summarizes application techniques for wrapping a body part.

APPLICATION STRATEGY 4.2

Application Techniques for Wrapping a Body Part

- Cover open wounds with a sterile dressing and secure with tape.
- Place the injured muscles in a shortened state but then have them maximally contracted.
- If the hip and knee must be slightly flexed, place the heel on a 1.5- to 2-in heel lift.
- Begin distal to the injured area and move in a proximal direction, lifting up against gravity.
- Stretch the wrap one-half to one-third of its total elastic capability prior to application.
- Overlap each turn of the wrap by at least one-half of the previous underlying strip.
- Secure the end of the wrap with elastic tape for added support.
- After participation, remove the wrap and wash it in a washing machine on a delicate cycle. If possible, hang the wrap to dry to prevent losing its elasticity.

Using a tape cutter dipped in a skin lubricant, the tape should be removed immediately after practice. The cutter should follow a path

along the body's natural contours; because the injury is an inversion sprain, the cut should take place on the medial side of the ankle. During cutting, the tape should be lifted up and away from the skin. Removing the tape involves slowly pulling it in the direction of the natural hair growth. Following the removal, the skin should be cleansed and a skin moisturizer should be applied.

COMMON TAPING AND WRAPPING TECHNIQUES

? An individual has sustained a mild thigh contusion. Immediate management of the injury includes maintaining compression on the injury throughout the remainder of the day. How should the compression be applied, and why?

The following taping and wrapping techniques are provided as a guide to application. When taping or wrapping a body part, it is appropriate to adapt the technique to the individual's needs.

Taping and Wrapping Techniques for the Lower Extremity

Great Toe Taping

This taping technique is used to limit motion at the 1st metatarsophalangeal joint. Preparation for this taping includes placing an adhesive dressing (e.g., Band-Aid) over the nail of the great toe for protective purposes. This technique begins with the placement of **anchor strips** on the great toe and at the midfoot (Fig. 4.3A). If prevention of hyperextension of the toe is desired, a strip of tape is applied from the distal anchor to the proximal anchor on the plantar surface of the foot (Fig. 4.3B). Additional supportive strips are applied until the base of the 1st metatarsal is covered (Fig. 4.3C). This procedure is completed by reanchoring the strips at the great toe and midfoot (Fig. 4.3D). If

the injury involves hyperflexion, the supportive tape strips run on the dorsum of the toe and foot. Occasionally, the patient may have both a hyperextension and a hyperflexion injury; in this case, the two tapings may be combined to limit motion in both directions. This technique is most often applied using cloth athletic tape. However, variations include using tearable elastic tape.

Figure 4.3. Great toe taping. A, Apply anchors. **B,** Apply strip to plantar surface. **C,** Apply additional support strips. **D,** Apply anchors to close.

Arch Support

Arch support may be necessary in individuals with plantar fasciitis, high arches, fallen arches, or arch sprains and strains, or in those who run or jump excessively. Several techniques can be used to support the arches of the foot. In taping the arches, the patient's foot should be in a position of slight plantar flexion.

Arch Support: Technique 1

A simple arch support uses three to four circular strips of tape applied around the midfoot region. The first strip is anchored on the dorsum of the foot and encircles the lateral border of the foot. As the strip moves across the plantar aspect, the strip is secured under the 5th metatarsal with one hand while the other hand applies slight tension in an upward direction through the medial longitudinal arch (Fig. 4.4A). In this manner, tension is applied only through the arch area and does not constrict the blood vessels on the lateral aspect of the foot. Each subsequent strip overlaps the previous, underlying strip by one-half, until the entire arch is covered. In addition, by applying the strips from the distal to the proximal aspect of the foot, the exposed edges of the tape do not roll when socks are placed on the foot. An arch pad may be added to this technique for additional support (Fig. 4.4B and C). This technique is most often applied using cloth athletic tape. However, variations include using tearable elastic tape.

Figure 4.4. **Arch support: Technique 1. A,** Apply tape across the plantar aspect, secure under the 5th metatarsal, apply slight tension in an upward direction through the medial longitudinal arch (MLA). **B,** Apply overlapping strips until arch is covered. **C,** A pad can be applied under circular straps for additional support.

Arch Support: Technique 2

If additional support is required, an alternative X-arch technique may be applied. This technique can be particularly useful in providing support for the plantar fascia. An anchor strip is placed at the level of the distal metatarsal heads. Beginning at the base of the great toe, the tape is pulled along the medial aspect of the foot, around the heel, and angled across the arch to end at the starting point (Fig. 4.5A). The second strip begins at the base of the 5th metatarsal and then moves along the lateral aspect of the foot, around the heel, and angled across the arch, back to its point of origin (Fig. 4.5B). Alternating

subsequent strips of tape, the same pattern is followed until the entire arch is covered. The technique is closed using the simple arch taping technique (Fig. 4.5C). An alternative closing technique is to use elastic tape. Special care should be taken when laying tape around the posterior aspect of the heel as blisters can easily form with this technique.

Figure 4.5. Arch support: Technique 2. X-pattern arch taping. **A,** Following placement of anchor, apply tape moving from the great toe, along the medial foot, around the heel, and angled back to starting point. **B,** The next strip begins at the 5th metatarsal, moves along the lateral foot, around the heel, and angled back to starting point. **C,** Finish using a simple arch taping.

Arch Support: Technique 3

This technique provides additional support to the medial longitudinal arch. This technique differs from the previous taping in the direction of pull of the support strips. Following the application of the distal anchor, the tape is pulled from the base of the great toe along the medial aspect of the foot, around the heel, and angled across the arch to end at the starting point (Fig. 4.6A). The next strip of tape initially follows the same pattern, but from underneath the foot, the tape is angled toward the medial longitudinal arch proximal to the previous strip (Fig. 4.6B). The process is repeated until the arch is covered. The technique is closed by applying a simple arch taping.

Figure 4.6. Arch support: Technique 3. Alternate arch support taping. **A,** Following placement of anchor, apply tape moving from the great toe, along the medial foot, around the heel, and angled back to starting point. **B,** Follow same pattern but angle toward the medial longitudinal arch (MLA) proximal to the previous strip. Finish using a simple arch taping.

Metatarsal Arch Taping

This technique can be advantageous in the management of metatarsalgia and Morton neuroma (see Chapter 15). It is designed to provide support for the metatarsal arch. A teardrop-shaped felt pad is placed slightly proximal to the heads of the 2nd through 4th metatarsals (**Fig. 4.7A**). The pad is held in place by anchoring it with elastic tape (**Fig. 4.7B**). Caution must be taken to avoid applying the tape too tightly, resulting in restriction of normal foot movement.

Figure 4.7. Metatarsal arch taping for metatarsalgia and Morton neuroma. **A,** Apply teardrop pad slightly proximal to the 2nd through 4th metatarsal heads. **B,** Anchor using elastic tape.

Closed Basket Weave Ankle Taping

The closed basket weave technique is used to provide external support to ankle ligaments and joint proprioception during activity. Studies have shown that taping the ankle does reduce the risk of future sprains, although it is unclear whether the enhanced ability to detect inversion or eversion movements is a direct result of the taping.[1,7] Because most ankle sprains are caused by excessive inversion, this explanation focuses on providing support to the lateral ligaments. Adaptations can be made for eversion ankle sprains by neutralizing the pull of the stirrups for support.

The lower leg and foot should be clean, dry, and free of hair. A gauze or foam pad with a lubricant should be applied to the dorsum of the ankle and Achilles tendon area. The patient is placed in a subtalar neutral position with the foot held at 90° flexion. A proximal anchor should be placed approximately 4 to 6 in above the ankle joint, distal to the belly of the gastrocnemius. The distal anchor is positioned so that it bisects the styloid process of the 5th metatarsal. Beginning on the medial aspect of the superior anchor, a **stirrup strip** is applied so that it runs down behind the medial malleolus, under the heel, and behind the lateral malleolus, then pulls up on the lateral aspect, and ends on the superior anchor (**Fig. 4.8A**).

Figure 4.8. Closed basket weave ankle taping. A, Apply proximal and distal anchors; apply a stirrup strip. **B,** Apply a horseshoe strip. **C,** Continue to alternate stirrups and horseshoes. **D,** Apply figure eight. **E,** Apply heel locks. **F,** Close with horizontal anchor strips.

Next, beginning on the medial aspect of the distal anchor, a horseshoe strip of tape is placed along the base of the 1st metatarsal and behind the heel, following the base of the 5th metatarsal, and ends on the lateral aspect of the distal anchor (Fig. 4.8B). The next stirrup overlaps the first by one-half to two-thirds of the previous underlying stirrup. A second horseshoe is applied, working again from medial to lateral, overlapping one-half to two-thirds of the previous underlying strip. This alternation continues until at least three stirrups and three horseshoes are in place (Fig. 4.8C).

The design of this technique gives the tape an appearance of a woven

basket and increases the overall strength on the taping. A figure eight and heel locks are then applied (Fig. 4.8D). The figure eight starts on the lateral malleolus, crosses over the dorsum of the foot to the medial arch, follows under the foot and up on the lateral aspect of the foot, crosses over the top of the foot to the medial malleolus, and then continues behind the lateral malleolus and back to the starting point. The technique continues by initiating the application of the heel locks (Fig. 4.8E). The tape is directed over the dorsum of the foot and down the medial arch, angled back toward the heel as it crosses the bottom of the foot, and pulled up on the lateral aspect of the heel so that it runs behind the lateral malleolus and around the heel to the medial malleolus. From the medial malleolus, the tape is directed over the dorsum of the foot and down the lateral side, angled back toward the heel as it crosses the bottom of the foot, and pulled up on the medial aspect of the heel so that it moves behind the medial malleolus and around the heel to the lateral malleolus. Finally, the taping technique is closed from distal to proximal using horizontal anchor strips, which overlap one-half to two-thirds of the previous underlying strip (Fig. 4.8F). For additional support, a second figure eight and additional heel locks may be applied. There are many variations to this basic technique, including use of moleskin, ELASTIKON, and other specialty tapes to increase the strength of the technique as well as using fewer strips of tape when working with patients who have less severe injuries or who have completed their rehabilitation program.

The most common problem with applying tape is that it can be applied too tightly, resulting in constriction of circulation and discomfort. This is especially true with the distal anchor, but this can be avoided by placing the distal anchor on the foot without applying tension.

Achilles Tendon Taping

Taping of the Achilles tendon limits excessive dorsiflexion and, in doing so, reduces the tension placed on the tendon. The patient lies in a prone position on the taping table with the lower leg extended over the table. The foot is passively dorsiflexed to determine the spot of discomfort. This indicates the point to which motion is to be allowed while restricting any further, painful

motion. The patient holds the foot in slight plantar flexion, and, using nonelastic tape, anchors are applied at the base of the metatarsals and 4 to 6 in above the ankle joint, slightly distal to the belly of the gastrocnemius (**Fig. 4.9A**). A heel pad with lubricant is placed over the Achilles tendon. Using 2-in elastic tape, three to five strips are applied in an X pattern from the distal to proximal anchor, forming a **checkrein** (**Fig. 4.9B** and **C**). The X is reanchored distally and proximally with nonelastic tape (**Fig. 4.9D**). The patient then moves to a seated position, and, using elastic tape, a figure eight and heel locks are applied (**Fig. 4.9E** and **F**). Caution should be taken to avoid applying added pressure over the irritated Achilles tendon area. In addition, a heel lift also may be placed in the shoe to limit dorsiflexion; however, lifts should be placed in both shoes to prevent any undue stress on other body parts. This technique can be modified to meet the needs of the patient by using different types of specialty tapes or using different types of tape in combination.

Figure 4.9. Achilles tendon taping. A, Apply anchors. **B,** Apply three to five strips in an X pattern from distal to proximal anchor. **C,** Form a checkrein. **D,** Reanchor the X distally and proximally. **E and F,** Apply a figure eight and heel locks.

Taping for Medial Tibial Stress Syndrome

Often incorrectly referred to as *shin splints*, medial tibial stress syndrome (MTSS) is used to denote pain found on the anterior shin. MTSS has many different causes, but often, MTSS pain is directly related to stress on the medial longitudinal arch that is caused by hyperpronation.[8] Although rest has been found to be the best treatment for this condition, providing support to the medial longitudinal arch may help to alleviate symptoms (see **Fig. 4.6**). If the condition is related to tendinitis of the tibialis posterior muscle, taping the

ankle to limit eversion may provide some relief as well (see Fig. 4.8). If you suspect the pain is due to periositis, the patient may find relief with the basic taping for anterior shin pain described in Figure 4.10. The purpose of this technique is to provide support to the muscles attaching on the anteromedial and anterolateral aspects of the lower leg and decrease stress being placed on the tibia. Stress fractures and compartment syndromes do not benefit from taping and actually may be aggravated by compression from the tape. Taping should not be attempted until the true source of the patient's pain is determined.

Figure 4.10. Taping for anterior shin pain. A, Apply anchor distally above the malleoli and proximally at the tibial tuberosity. **B,** Apply medial and lateral anchor strips distal to proximal. **C,** Apply strips in an alternating oblique direction, forming an X over the anterior shin. **D,** Apply medial and lateral anchors; apply distal and proximal anchors.

The patient stands on a table facing the athletic trainer. A heel lift is placed under the heel of the leg being taped to relax the muscles. Anchors are placed distally above the malleoli and proximally at the tibial tuberosity (Fig. 4.10A). Medial and lateral anchor strips are placed from distal to proximal, lifting up against gravity (Fig. 4.10B). These strips should follow the line of the malleoli. Tape is applied in an alternating oblique direction, forming an X over the anterior shin and working distal to proximal until the entire anterior shin is covered (Fig. 4.10C). Next, medial and lateral anchors are applied, followed by the placement of distal and proximal anchors (Fig. 4.10D).

Knee Hyperextension

This taping limits hyperextension of the knee and may be applied with elastic or nonelastic tape. With the patient standing on a table with the heel elevated, a superior anchor is placed at midthigh, encircling the entire thigh, and then an inferior anchor is applied 2 to 3 in below the tibial tuberosity (Fig. 4.11A). A

gauze pad with lubricant is placed in the popliteal space, reducing the friction of the nerves and circulatory supply to the knee. From the inferior anchor, apply tape strips in an X pattern over the gauze in the popliteal space. The X pattern should begin wide and should then narrow as the popliteal space is covered. The last strip runs perpendicular to the anchors (Fig. 4.11B). The technique is completed by applying two to three anchors on the lower leg and four to five anchors on the thigh, each overlapping one-half to two-thirds of the previous underlying strip (Fig. 4.11C). When completed, the taping should allow knee flexion and extension but should limit hyperextension.

Figure 4.11. Knee hyperextension strapping. A, Apply distal and proximal anchors. **B,** From the inferior anchor, apply tape strips in an X pattern; pattern should begin wide and become narrow; the last strip should be perpendicular to the anchors. **C,** Apply two to three anchors on the lower leg and four to five anchors on the thigh.

Patellofemoral Taping: McConnell Technique

The term patellofemoral syndrome refers to a collection of biomechanical dysfunctions that result in pain in, around, and under the patellofemoral joint due to patellar misalignment. This technique is designed to be used in conjunction with a comprehensive therapeutic intervention program to treat patellofemoral pain by correcting patella alignment and strengthening muscles needed to control hip and knee motion.[9] It is not so much the application of the tape that corrects the alignment, but rather the technique allows the patient to exercise pain-free so he or she can utilize exercise to correct the alignment issues. The McConnell technique also provides a sustained stretch of tight

lateral structures and improves lower limb mechanics. An essential component of this taping is an evaluation of the patella orientation, including the components of gliding, tilt, rotation, and anteroposterior orientation.[9] Pain reduction has been shown to occur as a result of an inferior shift in patellar displacement with proper application.[10]

The area should be shaved and clean, and tape adherent should be applied. The patient should be positioned with the knee in full extension. The two tapes used for this technique are specialty tapes, Fixomull and Leuko Sportstape (Beiersdorf Australia, Ltd, New South Wales, Australia). The initial step is the application of base strips (Fixomull tape) covering the patellar. This is performed by placing strips on the lateral condyle and extending them across the anterior aspect of the knee to the medial femoral condyle of the knee. For the remainder of the technique, the Leuko Sportstape is used.

In correcting a lateral glide, the tape begins on the lateral border of the patella and is pulled medially (**Fig. 4.12A**). The soft tissue should be lifted over the medial femoral condyle toward the patella to provide more secure fixation. A lateral tilt correction is performed by placing the tape on the middle of the patella. The next step is to pull the tape medially to lift the lateral border (**Fig. 4.12B**). The soft tissue over the medial femoral condyle should be lifted toward the patella for more secure fixation. A correction of external rotation is completed by applying the tape to the middle of the inferior border of the patella. Rotating the inferior pole internally and the superior pole externally, the tape is pulled upward and medially (**Fig. 4.12C**). In correcting an anteroposterior condition, the middle of tape is placed on the superior half of the patella. The tape is attached equally on both sides, lifting the inferior pole (**Fig. 4.12D**).

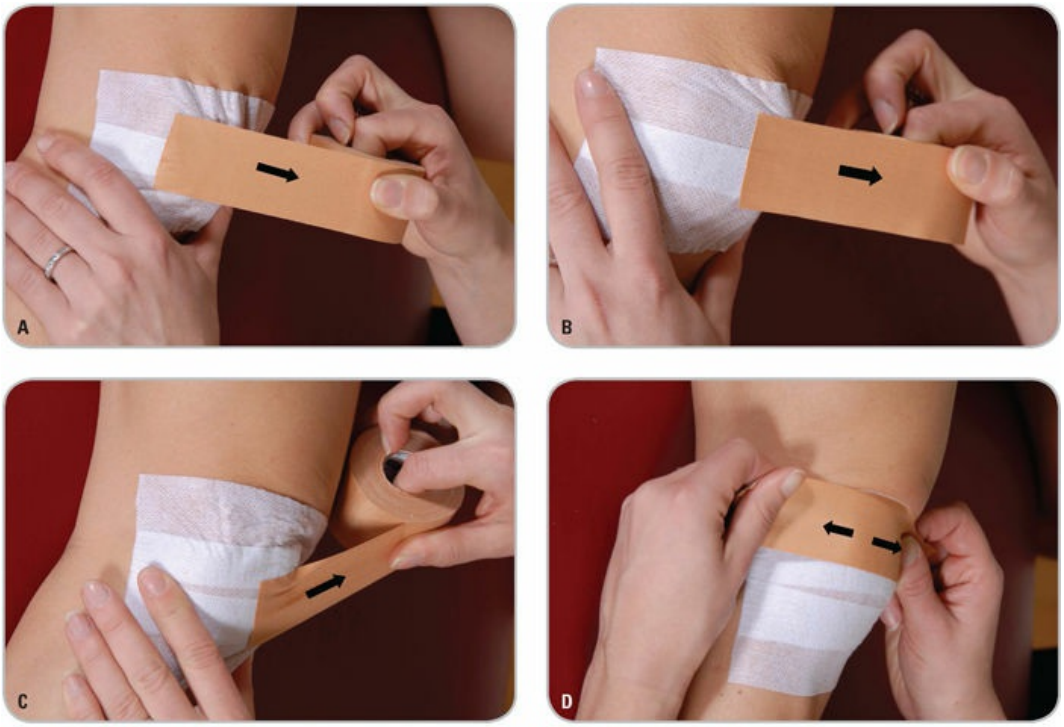

Figure 4.12. Patellofemoral taping using the McConnell technique. A, Lateral glide correction. **B,** Lateral tilt correction. **C,** External rotation correction. **D,** Anterior–posterior correction.

The tape is worn by the patient throughout the day. Because the tape is likely to loosen, the patient should be instructed to tighten the strips as necessary.

Quadriceps and Hamstrings Wrap

A thigh strain may involve either the quadriceps or the hamstrings muscle group. This technique can be used to provide compression and/or support for either group. When applying a wrap to the hamstring, quadriceps, or groin muscle groups, the wrap is applied over compression shorts and under the outer garment. As such, you may want to instruct the patient to void his or her bladder prior to having the wrap applied.

If the quadriceps muscles are involved, the heel of the injured leg should be elevated 2 to 3 in on a taping block. With the thigh in a neutral position, an elastic wrap is placed on the anterior aspect of the midthigh distal to the painful site (Fig. 4.13A). The wrap is applied in an upward and lateral direction, encircling the thigh (Fig. 4.13B). Elastic tape is then applied over the wrap to provide additional support. For this technique, the 6-in wrap is

used. Most often, a double-length wrap will be used.

Figure 4.13. Quadriceps wrap. A, Place elastic wrap on the anterior midthigh distal to the painful site. **B,** Apply wrap in an upward and lateral direction, encircling the thigh.

Two techniques may be used if the injury is a hamstring strain. The first technique is appropriate when the strain is to the distal portion of the muscle group. The wrap is applied in a manner similar to the quadriceps wrap. It is directed in an upward and lateral manner, encircling the thigh, and elastic tape is then applied over the wrap to provide additional support. The second technique may be used when the injury occurs in the proximal portion of the muscle group. The wrap is placed on the posteromedial aspect of the thigh, and it encircles the thigh several times, pulling from a medial to lateral direction (**Fig. 4.14A**). The wrap is then pulled up across the greater trochanter, continues around the lower abdomen, is brought around the opposite iliac crest over the waist and gluteals, and then crosses the greater trochanter, ending back on the anterior thigh (**Fig. 4.14B**). The thigh is encircled again, moving in a medial to lateral direction. Repeating the same pattern, the wrap is then reinforced with elastic tape (**Fig. 4.14C**).

Figure 4.14. **Hamstrings wrap. A,** Encircle thigh several times, pulling from a medial to lateral direction. **B,** Pull wrap up across the greater trochanter, around the lower abdomen to the opposite iliac crest, over the waist and gluteals, cross the greater trochanter, and end on the anterior thigh. **C,** Repeat the pattern and reinforce with nonelastic tape.

Quadriceps Contusion Wrap

This technique can be used to provide compression or protection for a quadriceps contusion. In the management of a contusion, if compression is desired, a felt pad of 0.5-in thickness should be placed over the injured site. The pad is secured by an elastic wrap (Fig. 4.15A). Beginning at a point distal to the injury, the wrap is applied in an upward and lateral direction, encircling the thigh (Fig. 4.15B). If the desired outcome is to protect the area during activity, a foam pad should be placed over the involved area. Following application of the elastic wrap, the wrap should be covered with elastic tape to provide additional support to the area.

Figure 4.15. **Quadriceps contusion wrap. A,** Place a pad over the injured site. **B,** Distal to injury, apply elastic wrap in an upward and lateral direction encircling the thigh.

Groin Wrap

The term groin strain may refer to damage of the muscle groups controlling hip

flexion or hip adduction. When applying a wrap to support either of these muscle groups, it is important to pull the wrap in the same direction as the movement that is being supported. Figure 4.16 depicts a groin wrap technique to support the hip adductor muscles, the muscles that are in the inside of the hip and move the thigh toward the midline of the body. When supporting the adductor muscles, the heel is elevated on a taping block, with the hip internally rotated. The wrap is then placed on the lateral aspect of the thigh and encircles the thigh in a medial direction to draw the thigh further into internal rotation (Fig. 4.16A). The wrap continues around the thigh, crossing over the greater trochanter and continuing across the lower abdomen, covering the iliac crest and around the waist and gluteals, and then crossing the greater trochanter and ending back on the thigh (Fig. 4.16B). Following the same pattern, the wrap is then reinforced with elastic tape (Fig. 4.16C).

Figure 4.16. Groin wrap. A, Place wrap on the lateral thigh and encircle the thigh in a medial direction. **B,** Continue to wrap around the thigh, over the greater trochanter, across the lower abdomen, cover the iliac crest, around the waist and gluteals, cross the greater trochanter, and end on the thigh. **C,** Reinforce with elastic tape.

Hip Contusion Wrap

This technique is designed to keep padding in place that is intended to prevent iliac crest contusion from reinjury. A protective pad should be placed over the iliac crest at the point where the contusion is located. The pad is secured by applying an elastic wrap in a **spica** pattern. The wrap starts at the distal aspect of the anterior thigh and moves over the top of the pad, around the waist, diagonally down toward the lateral thigh, and behind the thigh to the starting point (Fig. 4.17A). This pattern is repeated for the length of the wrap (Fig.

4.17B and C). Application of elastic tape over the wrap provides additional support.

Figure 4.17. Hip contusion wrap. A, Place a protective pad over the iliac crest; apply elastic wrap in a spica pattern. **B,** Repeat the pattern. **C,** Reinforce with elastic tape.

Taping and Wrapping Techniques for the Upper Extremity

Shoulder Spica Wrap

This technique can be used to provide support and stabilization for the glenohumeral joint. The patient should hold the injured arm in internal rotation. The technique begins by encircling the arm in a posterior-to-anterior direction at the midbiceps. Next, the anterior chest is crossed in the region of the pectoralis major (Fig. 4.18A). Wrapping in this direction maintains internal rotation of the glenohumeral joint and limits external rotation. The limitation of motion is determined by the amount of internal rotation in which the arm is placed initially. The wrap is brought under the opposite axilla, across the back, and over the acromion process in an anterior direction (Fig. 4.18B). The wrap is then continued through the axilla, around the arm, and again across the anterior chest (Fig. 4.18C). Finally, the wrap is secured with nonelastic tape (Fig. 4.18D).

Figure 4.18. Shoulder spica. A, Encircle the arm in a posterior-to-anterior direction at the mid-biceps. **B,** Cross the anterior chest and bring the wrap under the opposite axilla, across the back, and over the acromion process. **C,** Continue to wrap through the axilla, around the arm, and again across the anterior chest. **D,** Reinforce with nonelastic tape.

Elbow Hyperextension

This technique is designed to restrict painful motion while permitting functional movement. The patient should be instructed to clench the fist and hold the elbow in slight flexion with the palm facing up. To determine the degree of flexion, the elbow should be extended to the point of discomfort and then slightly flexed from that point. Using either nonelastic or elastic tape, anchors are applied to the midregion of the forearm and upper arm (Fig. 4.19A). After approximating the distance between the two anchors, two strips of tape (the same length as the distance between the anchors) are torn from the roll. A checkrein is constructed by placing these two pieces of tape back to back and then adding five or six additional pieces of tape over the template in an X fan shape (Fig. 4.19B). If additional strength is needed to prevent full extension, nontearable may be substituted to create the checkrein. The checkrein is then attached to the anchors by applying three or four additional anchors. The anchors should overlap each other by one-half to two-thirds. Using elastic tape or wrap, a figure eight then may be applied to further secure

the taping and prevent slipping during activity (Fig. 4.19C). The radial pulse should be checked and monitored to determine if the tape is too tight.

Figure 4.19. Elbow hyperextension. A, Apply anchors to the midregion of the forearm and the upper arm. **B,** Construct a checkrein in an X fan shape. **C,** Attach the checkrein by applying three to four additional anchors.

Elbow Sprain Taping

The purpose of this taping is to provide support for the collateral ligaments of the elbow. The patient's arm is placed in a position of slight flexion. Anchors are applied to the midregion of the forearm and upper arm. If the injury is to the medial collateral ligament, three or four strips of nonelastic tape are placed over the ligament in an X pattern (Fig. 4.20A). If additional strength is needed, consider using tape with higher tensile strength such as nontearable tape. The strips are then secured above and below the joint with elastic tape (Fig. 4.20B). The cubital fossa should remain open. The same technique can be modified for injury to the lateral collateral ligaments by changing the location of the strips.

Figure 4.20. Elbow sprain taping. A, Apply anchors to the midregion of the forearm and upper arm. **B,** Place three to four strips of nonelastic tape over the ligament in an X pattern. Secure above and below the joint with elastic tape.

Wrist Taping

Hyperextension or hyperflexion of the wrist may damage the ligaments of the wrist. Taping can provide support and stability for the wrist.

Wrist Taping: Technique 1

For a mild sprain, three or four circular strips of tape may be applied to the wrist. The strips should be positioned from distal to proximal and should overlap the previous underlying strip by one-half to two-thirds the width of the tape (Fig. 4.21).

Figure 4.21. Wrist taping: Technique 1. Apply three to four circular strips of tape to the wrist.

Wrist Taping: Technique 2

This technique can help to limit painful wrist motion. The patient should be instructed to spread his or her fingers. The wrist is positioned in slight flexion or extension, depending on the injury. Anchor strips are placed around the wrist and at the heads of the metacarpals (Fig. 4.22A). If the intent is to limit hyperextension, three or four strips of tape are placed in an X pattern over the palmar aspect of the hand; if the intent is to limit hyperflexion, the X pattern is positioned over the dorsum of the hand (Fig. 4.22B). Next, using either elastic or nonelastic tape, a figure eight is applied around the wrist and hand (Fig. 4.22C–E). The figure eight should begin on the radial aspect of the proximal anchor, travel across the dorsum of the hand around the metacarpal heads and across the palm of the hand, and end on the ulnar side of the proximal anchor (Fig. 4.22F). As the tape is brought through the web space of the thumb and index finger, the tape should be crimped to prevent irritation of the skin.

Figure 4.22. Wrist taping: Technique 2. A, Place anchor strips around the wrist and metacarpal heads. **B,** Place three to four tape strips in an X pattern over the palmar aspect or dorsum of the hand. **C–F,** Apply a figure eight beginning on the radial aspect of the proximal anchor.

Thumb Taping

Most thumb injuries occur when the thumb is hyperextended. Thumb taping is designed to provide support and limit extension of the first metacarpophalangeal joint. The thumb is placed in a position of slight flexion and adduction, and an anchor is placed on the wrist. Next, a strip of tape is applied, beginning on the ulnar aspect of the proximal anchor and continuing upward over the palmar aspect of the thenar eminence on the thumb, crossing over the metacarpophalangeal joint, and encircling the thumb (Fig. 4.23A). The strip is then reanchored on the dorsal aspect of the anchor. This line of pull makes an X pattern. Three or four X patterns should be applied before

finishing the taping with additional anchors (Fig. 4.23B). Based on the direction of movement that causes the patient pain, this technique can be modified by placing the restraining strips so that the line of pull is in the opposite direction of the motion that causes pain.

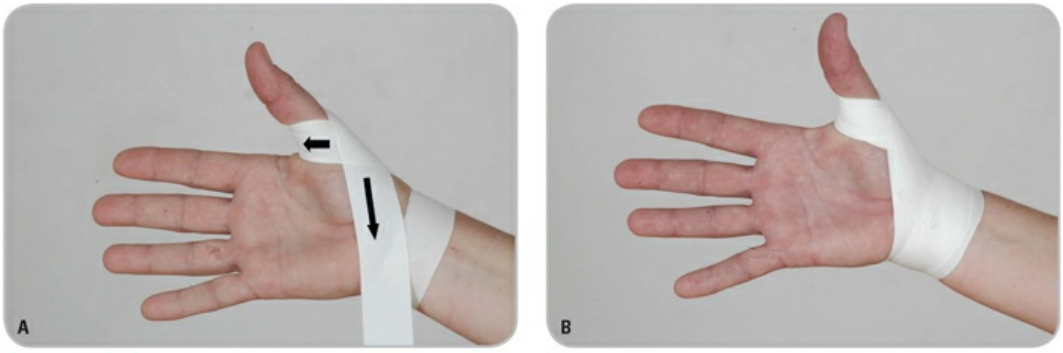

Figure 4.23. Thumb spica. A, Apply an anchor on the wrist; apply tape on the ulnar aspect of the proximal anchor and continue upward over the palmar aspect of the thenar eminence, cross over the MP joint, and encircle the thumb; this line of pull makes an X pattern. **B,** Apply three to four Xs; apply an anchor at the wrist to finish.

Finger Taping Technique

Sprains of the interphalangeal joints occur frequently. Taping can assist in providing support for an unstable interphalangeal joint. "Buddy" taping for the fingers involves using an adjacent finger for support. Strips of narrow tape are applied around the proximal phalanx and distal phalanx of the two fingers, leaving the joints uncovered to permit limited flexion and extension of the fingers (Fig. 4.24).

Figure 4.24. Buddy taping for the fingers. Apply narrow tape strips around the proximal and distal phalanx of two fingers.

If additional support for the medial and lateral collateral ligaments is needed, anchors can be placed just proximal and distal to the injured joint. Working from distal to proximal, two narrow strips of tape are applied in an X pattern over the collateral ligaments, followed by a longitudinal strip to connect the two anchors (Fig. 4.25A and B). A figure eight may be applied, using care not to impinge on the circulation. Because the blood supply is very superficial and easily compressed, capillary refill should be checked after taping.

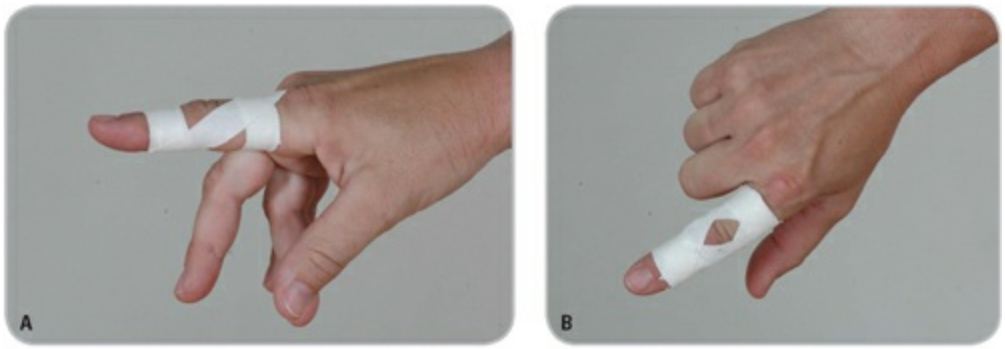

Figure 4.25. Collateral ligament taping. A, Apply anchors proximal and distal to the injured joint; working from distal to proximal, apply two narrow tape strips in an X pattern over the collateral ligaments. **B,** Apply a longitudinal strip to connect the two anchors.

A felt pad of 0.5-in thickness should be placed over the injured site. The wrap should begin distal to the injury site and be applied in an upward and lateral direction, encircling the thigh. This prevents any edema formation from settling in the distal digits and provides support against gravitational forces. The wrap should be stretched from one-half to one-third of its total elastic capability. Excessive stretching may constrict circulation, compress superficial nerves, and impair function. Each turn of the wrap should be overlapped by at least one-half of the previous, underlying strip.

POWERFLEX TAPING SYSTEM

Developed by Andover Healthcare, Inc, the PowerFlex Taping System was introduced in 2012 as an alternative to using the traditional combination of

prewrap and cotton zinc oxide tape taping techniques.[11] All taping techniques previously described within this chapter can be applied using the PowerFlex Taping System (**Fig. 4.26A**–**F**), which includes PowerFlex, PowerTape, and VictoryTape. Because the PowerFlex line of products are cohesive, the need for using spray adherents and prewrap has been eliminated.[5] Using porous synthetic tape for both the underwrap and tape permits sweat to pass through the materials, decreasing or eliminating the need to reapply tape between bouts of exercise within the same day.[5] Using cohesive, synthetic tape as the underwrap in conjunction with basic cotton athletic tape has been found to be more effective in maintaining range-of-motion restrictions than the traditional prewrap and cotton zinc oxide tape combination.[12] When using both self-adherent or cohesive prewrap and tape, range-of-motion restrictions were maintained even after 30 minutes of exercise, whereas the traditional prewrap and cotton zinc oxide tape combination did not.[6] Most of the major tape manufacturers now offer cohesive tape products.

Figure 4.26. PowerFlex taping system: Basic prevention technique for the ankle. A, PowerFlex is directly applied to clean and dry ankle. Tape adherent spray and anchor strips are not needed. **B,** A series of heel locks secures the ankle joint in a neutral position. **C,** A series of figure eight strips are applied next. **D,** The basket weave technique begins by applying stirrups on the medial aspect of the ankle and ending on the lateral aspect. **E,** Alternating between applying horseshoe strips and stirrups. **F,** Finishing with anchor strips.

KINESIO TAPING

Developed by Japanese chiropractor Kenzo Kase, DC, in 1973, therapeutic taping has been used to support muscles by improving the quality of muscle contractions in weakened muscles, reduce muscle fatigue, reduce cramping and potential injury to muscle tissue, increase range of motion, and relieve pain.[13] Although it is uncertain how Kinesio Taping (KT) works, it is thought that when a muscle is inflamed, swollen, or stiff due to fatigue or injury, the interstitial space between the skin and underlying connective tissues become

compressed, thereby compromising the flow of lymphatic fluid. This tissue compression can then stimulate pain receptors beneath the skin. The intent of KT application is to create convolutions in the skin to increase the interstitial space. These convolutions are created when the muscles and skin of the impacted area are stretched prior to the application of the tape. After the tape has been applied and the muscles return to a relaxed position, convolutions of the skin are formed, which increases the interstitial space, allowing for greater flow of lymphatic and venous fluids and thus less pain.[13,14] It is thought that the taping method can also inhibit muscles that may result in a muscle imbalance, enhance joint stability by increasing nutrition to the joint synovial fluid and hyaline cartilage, and increase range of motion by activating the neurological and circulatory systems.[13–16] Originally used primarily in sports medicine, it is currently being applied in other specialties, such as in orthopedics, traumatology, surgery of the motor system, neurology, oncology, and pediatrics.

Kinesio Tex Tape is designed to allow for a longitudinal stretch of 55% to 60% of its resting length but is not designed to stretch horizontally. The tape is made of a polymer elastic strand wrapped by 100% cotton fibers to permit the evaporation of body moisture. The material is latex-free, nonmedicated, quick-drying, and approximately the same weight and thickness of skin.[15,17] The tape is easy to apply, noninvasive, comfortable to wear, and can provide continued treatment for up to 3 to 5 days. KT can be used jointly with other treatment options such as ultrasound, electrical stimulation, hydrotherapeutic treatments, joint mobilization/joint mechanics, myofascial release, ice/heat, and intramuscular stimulation/trigger point.[18]

Application of the tape typically runs from one end of a muscle to the other. The strip of tape can be applied in the shape of a Y, I, X, fan, web, and donut. The shape is dependent on the size of the muscle and the desired effects. The Y technique is the most common shape and is used to surround a large muscle to either facilitate or inhibit muscle stimuli.[15] I strips are used for acute injury to limit edema and pain in small areas, such as the teres minor; X strips are used when the muscle's origin and insertion may change depending on the movement pattern of the joint, such as the biceps brachii or triceps brachii.[15,19]

The muscle is placed on gentle stretch with application of the tape at 10%

of its resting static length.[20] For chronically weak muscles or where increased contraction is desired, the tape is stretched from the origin to insertion to facilitate muscle function. For acute muscle injury or overstretched muscles, the tape is stretched from the insertion to the origin to inhibit muscle function.[19] For optimal adherence, the skin should be free of oil or lotions, shaved, and dry. In general, anchors are applied at both margins of the treatment area approximately 2 in below the origin or 2 in above the insertion of the muscle using a 1- to 2-in width strip of tape. The anchors are applied to the skin without tension due to potential skin irritation. The base anchors are secured and the desired tension is applied.[21]

Kinesio Taping Techniques for Specific Injuries

Some common examples of the use of therapeutic taping are included in this section. Because KT certification programs exist, it is recommended that health care practitioners complete these programs to become more proficient and knowledgeable about this method of taping.

Medial Tibial Stress Syndrome

Prior to selecting a method of treatment, the clinician must determine the cause of the pain. Pain may be due to multiple reasons including poor arch support, muscle weakness, improper footwear, or changes in running surfaces. The basic treatment protocol for MTSS involves a single Y strip applied with no tension on the inferior base of the 5th metatarsal just proximal to the head of the 5th metatarsal. Apply light (15% to 25%) or paper-off tension as each strip passes over the medial longitudinal arch moving toward the origin of the tibialis anterior, with one strip on either side of the muscle belly (**Fig. 4.27A**). Additional horizontal Y strips are then applied. Place the base of a 2-in KT strip on the medial calf with no tension just inferior to the painful site. While securing the base with one hand, apply light-to-moderate tension (25% to 50%) to the tails as you pull the skin laterally across the tibial border surrounding the area of pain. Apply the last inch of the tails with no tension in a splayed pattern to limit tension on the skin (**Fig. 4.27B**).[15]

Figure 4.27. Medial tibial stress syndrome.

Quadriceps Strain

In the postacute phase with the patient supine, apply an I strip of 2-in KT just superior to the anterior superior iliac spine (ASIS) with no tension. Have the patient move into hip extension. Apply light (15% to 25%) or paper-off tension until the I strip reaches the involved injured area. Just prior to passing over the suspected hematoma area, increase tension using the space correction technique. Apply light-to-moderate tension (25% to 50% of available tension) over the painful site. Once beyond the painful site, reduce tension to light. Secure the final 2 to 3 in of tape with no tension and then initiate glue activation of the tape prior to any further patient movement (**Fig. 4.28**).[15]


Figure 4.28. Quadriceps strain.

Patellar Tendinopathy

With the patient supine and the knee extended, the KT is measured and cut equal to the distance between the medial and lateral femoral condyles (**Fig. 4.29A**). The patient is then moved to a long-sitting position with the hip flexed at about 45°. Tear the paper backing of the tape in the middle third of the tape and place this section of the tape directly over the inferior pole of the patella (**Fig. 4.29B**). Apply a moderate tension (25% to 50%) with a downward pressure over the inferior pole of the patella. The patient then flexes the knee to about 90°, and the KT is positioned around the patella in the direction of the vastus lateralis and medialis with 15% to 25% tension (**Fig. 4.29C**).[15]

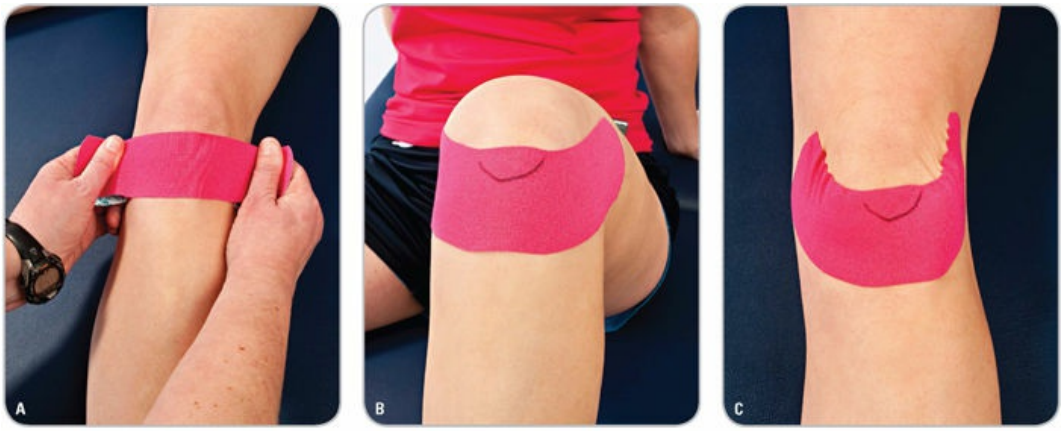

Figure 4.29. Patellar tendinopathy.

Rotator Cuff Impingement

This condition often refers to impingement of the supraspinatus, the long head of the biceps tendon, or the subacromial bursae under the coracoacromial arch. Begin by placing the base of a KT Y strip 2 in inferior to the greater tuberosity of the humerus with no tension. Ask the patient to move into shoulder adduction with the hand behind the back and to do lateral neck flexion to the opposite side. Apply light tension (15% to 25%) or paper-off tension to the Y strip. The superior tail should travel superior to the spine of the scapula, between the upper and middle trapezius muscles and end on the superior medial border of the scapula (**Fig. 4.30A**). The inferior tail should travel along the spine of the scapula with the final 1 to 2 in applied with no tension. Initiate glue activation of the tape prior to any patient movement.[15]

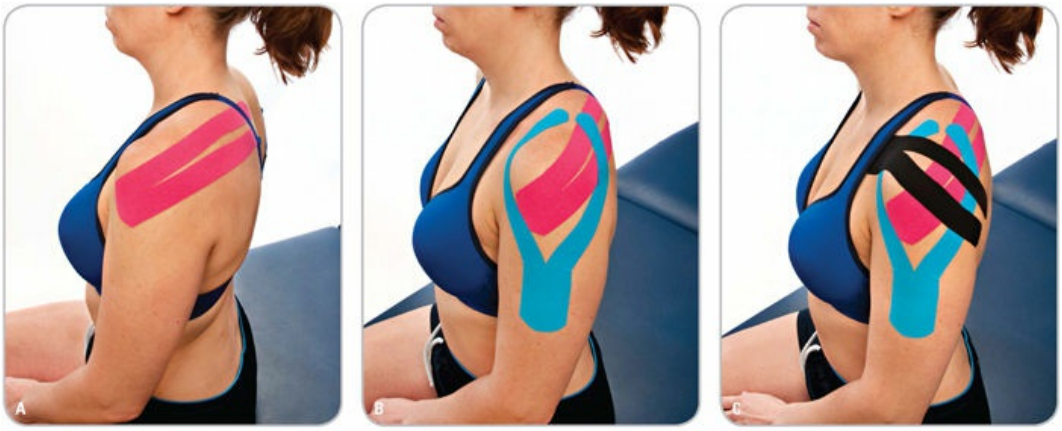

Figure 4.30. Rotator cuff impingement.

A second Y strip is applied over the deltoid muscle, moving from the insertion to the origin. Place the base of the KT Y strip 2 in inferior to the deltoid tuberosity with no tension. Both anterior and posterior tails are applied with light (15% to 25%) or paper-off tension. With the patient's arm abducted 90°, externally rotated, and in horizontal extension, apply the anterior tail around the outer border of the anterior deltoid to approximately the acromioclavicular (AC) joint with no tension on the final 2 in. With the arm remaining in abduction, move the arm into horizontal flexion with internal rotation. Apply the posterior tail along the outer border of the posterior deltoid to approximately the AC joint with no tension on the final 2 in (**Fig. 4.30B**).[15]

Finally, place the base of a 6- to 8-in Y strip on the anterior shoulder over the coracoid process with no tension. The base can be adjusted to place the cut of the Y just below the area of pain. While holding the base with one hand to ensure that no additional tension is applied to the base, apply moderate-to-severe tension (50% to 75%) to the tails while applying inward pressure over the area of pain with approximately half of the Y strip length. When half of the Y strip length is reached, slide the hand securing the base up to the point of end tension on the tape. Have the patient move into shoulder flexion with horizontal flexion and apply the remaining tails in a splayed out pattern to dissipate the created force with no tension. Initiate activation prior to any further movement by the patient (**Fig. 4.30C**).[15]

Erector Spinae Muscle Strain

Using an H technique, begin by having the patient move into flexion with rotation to the nonpainful side. Apply two I strips of KT with very light to moderate tension (15% to 25%) (**Fig. 4.31A**). Measure the third strip to extend approximately 2 in on either side of the previously applied strips. After removing about 2 in of the paper backing from one end of the I strip, apply light-to-moderate tension (15% to 25%) to secure the base and extend over the region of muscle spasm or pain. Do not add any inward tension. Slide the hand holding the base toward the middle of the back and hold no tension over the region of the transverse and spinous process. Have the patient move into rotation to assist with minimizing tension on the ends. While continuing to apply no pressure over the spinal column, use the other hand to apply another zone of light-to-moderate tension (15% to 25%) on the ipsilateral side. Secure the base with no tension (**Fig. 4.31B**). Initiate glue activation prior to any patient movement.[15]

Figure 4.31. Erector spinae muscle strain.

SUMMARY

1. Taping and wrapping a body part provides support and protection while allowing functional movement. Tape and wraps may be used to provide

immediate first aid, support an injured body part, or provide pain-free functional movement.

2. Taping products and techniques should be based on the needs of the patient. Patient needs can only be assessed by conducting a comprehensive orthopedic evaluation.
3. Used in conjunction with a comprehensive rehabilitation program, tape or wraps can allow for the early resumption of activity without the threat of reinjury.
4. When using tape, the skin should be inspected regularly for signs of irritation, blisters, or infection. In particular, skin that is red, dry, hot, and tender suggests an allergic reaction to the tape or tape adherent.
5. If the skin cannot be protected from irritation, it may be necessary to fit the patient with an appropriate brace rather than allow for continued irritation.
6. Tape types can be categorized based on strength: prewrap, tearable elastic, cohesive, basic athletic cloth tape, and specialty tape. Within each category, quality of tape is evaluated based on tensile strength and elongation properties.
7. Synthetic tape is porous, allowing sweat to escape from the patient, keeping the skin and tape dry. Cotton tape is nonporous and traps the sweat under the taping technique.

APPLICATION QUESTIONS

1. You are the head athletic trainer at a National Collegiate Athletic Association (NCAA) Division I university. During a professional seminar attended by your peers from other universities, one of the conference athletic trainers proposes mandatory ankle taping for football players for both practice and game situations. What are the pros and cons of this proposal?

2. You are responsible for submitting a budget request for athletic training supplies and must decide how much and what type of tape to order. What factors should you consider when making your decision? How can you make your supply budget stretch to meet the needs of the patients you serve? What policies might you put into place to decrease the amount of tape being used while still providing optimal injury prevention services for your patients?
3. A high school soccer player has been experiencing mild-to-moderate bilateral distal medial tibial pain during preseason practice. You suspect that the pain may be due to an overload on the athlete's arches. What different types of arch support and exercises might you suggest to reduce strain on the supporting structures?
4. As an interscholastic athletic trainer, a 16-year-old member of the girls varsity basketball team sustained two ankle sprains in the past two seasons. In both instances, return-to-play guidelines, as outlined by her family physician, included ankle taping for the remainder of the season. Prior to the start of her third year, her parents request a meeting with you to discuss taping versus bracing as an intervention for the prevention of another ankle sprain. What evidence-based research can you locate to support your recommendations as to what intervention you would recommend for this athlete?
5. An 18-year-old lacrosse player sustains a moderate ankle sprain at the end of practice. What options might you consider to provide compression to the injury site as part of the immediate management for this condition? What recommendations would you suggest to the athlete to care for this injury during the evening hours?

REFERENCES

1. Bandyopadhyay A, Mahapatra D. Taping in sports: a brief update. *J Hum Sport Exerc*. 2012;7(2):544–552.
2. Bragg RW, Macmohan JM, Overom EK, et al. Failure and fatigue characteristics of adhesive athletic tape. *Med Sci Sports Exerc*. 2002;34(3):403–410.

3. Mitchell L. Brace yourself taping essentials. *SportEX Dynamics*. 2006;7(1):16–20.
4. Schaeffer SL, Slusarski J, VanTeim V, et al. Tensile strength comparison of athletic tapes: assessed using ASTM D3759M-96, standard test method for tensile strength and elongation of pressure-sensitive tapes. *J Ind Technol*. 1999;16(1):2–6.
5. O'Neil R. [Personal Interview]. Vice-President CBI Health Quebec, Andover Healthcare, Inc. Sports Medicine Education, Research & Development. Salisbury MA. March 2015.
6. Purcell SB, Schuckman BE, Docherty CL, et al. Differences in ankle range of motion before and after exercise in 2 tape conditions. *Am J Sports Med*. 2009;37(2):383–389.
7. Verhagen EA, van Mechelen W, de Vente W. The effect of preventive measures on the incidence of ankle sprains. *Clin J Sport Med*. 2000;10(4):291–296.
8. Reshef N, Guelich DR. Medial tibial stress syndrome. *Clin Sports Med*. 2012;31(2):273–290.
9. McConnell J. The management of chondromalacia patella: a long term solution. *Aust J Physiother*. 1986;32(4):215–223.
10. Derasari A, Brindle TJ, Alter KE, et al. McConnell taping shifts the patella inferiorly in patients with patellofemoral pain: a dynamic magnetic resonance imaging study. *Phys Ther*. 2010;90(3):411–419.
11. Andover Healthcare, Inc. *PowerTape™ & VictoryTape™. New. Innovative. Different.* http://coflexnl.com/pdf/PowerTape%20Brochure.pdf. Accessed November 16, 2015.
12. Van Wagoner R, Docherty CL, Simon J. Self-adherent underwrap maintains range of motion restriction after exercise. *J Athl Train*. 2012;47(2):S71.
13. Kase K. *Illustrated Kinesio-Taping*. 4th ed. Tokyo, Japan: Ken'i-kai Information; 2003.
14. Kahonov L. Kinesio taping, part 1: an overview of its use in athletes. *Athl Ther Today*. 2007;12(3):17–18.
15. Kase K, Wallis J, Kase T. *Clinical Therapeutic Applications of the Kinesio Taping Method*. 2nd ed. Tokyo, Japan: Ken'i-kai; 2003.
16. Pope ML, Baker A, Grindstaff TL. Kinesio taping technique for patellar tendinopathy. *Athl Train Sports Health Care*. 2010;2(3):98–99.
17. Zajt-Kwiatkowska J, Rajkowska-Labon E, Skrobot W, et al. Application of Kinesio Taping® for treatment of sports injuries. *Medsportpress*. 2007;13(1):130–134.
18. Silverman RS. Q&A: the unique benefits of therapeutic taping. *Rehab Manag*. 2010;23(6):26–29.
19. Kahanov L, Kaltenborn JM. Kinesio taping, part II: an overview of use with athletes. *Athl Ther Today*. 2007;12(4):5–7.
20. Halseth T, McChesney JW, Debeliso M, et al. The effects of Kinesio taping on proprioception at the ankle. *J Sports Sci Med*. 2004;3(1):1–7.
21. Osterhue DJ. The use of Kinesio™ taping in the management of traumatic patella dislocation. A case study. *Physiother Theory Pract*. 2004;20(4):267–270.