

Kinesio Tape Application on Hypertrophic Scar Formation

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Summary: Study of a patient who had three procedures on his abdominal wall. The procedures were for diverticulitis, hernia and finally removal of mesh for hernia repair due to infection.

Emphasis of Presentation: The emphasis is to profile the resolution of the keloiding of the scar. The extra benefits of sensory changes i.e. the restoration of sensation to the scar area will be mentioned. This is a case study which includes pictures at various stages of the treatment process.

Clinical research report or Basic research report:

The patient has a 10 1/4 "scar over the rectus abdominis. The scar was red, thick in width and texture. There were two areas of small puckering adjacent to the main scar. There is banding particularly in the central portion. Hypertrophic scar management has been a challenge for clinicians. There have been many products, such as pressure gloves and silicone gel sheets, on the market. Many modalities are used to help resolve scar formation including electrical devices. Tape has been used over scar tissue for compression and some sections were put under tension as well. Various modalities were used for mobilization of the tissue.

Generally there is evaluative information as to muscle strength, subjective sensory information, and length and approximate width/depth of the central portion of the scar. The tape was applied in various directions, and long 'I' tape was used for central compression. Most of the tape was in 'I' shape; I also tried small power space corrections over small puckered areas.

Background: Hypertrophic and keloid scars are common, developing in 5-15% of wounds.(1) There have been a variety of treatment approaches developed, from surgical revision, medication, compression, laser, corticosteroids, radiation, and cryosurgery, to interferon therapy. The use of compression has been done with occlusive dressings, use of elastomer pads, silicone gel sheets and recently Kinesio Tape. This report describes the use of Kinesio Tape in the treatment of hypertrophic scar formation on a post-operative abdominal scar.

Case Description: This 38 year old male (R.S.) was diagnosed in 2001 with a diverticular abscess. He was treated conservatively until September 2002 when he underwent a sigmoid colon resection. Four months later the patient developed an abdominal hernia in the lower left quadrant of the abdomen. A hernia repair using a mesh implant was performed on May 23, 2003. By March 2004 the patient complained of abdominal tenderness and redness for which he was treated with a broad-spectrum antibiotic. The symptoms did not subside. On April 13, 2004 the mesh was excised and the wound was left open to heal by secondary intention. In August of 2004 the patient was referred to a Plastic Surgeon because the scar was large and painful. The surgeon referred the patient to Physical Therapy. The assessment revealed a 10 1/4" serpentine abdominal scar that was raised 5mm., hyper-pigmented, painful, red, firm with a center banding evident. Patient's abdominal strength was in the 3- to 3+ range (0-5 scale). His functional index scale was 67% and the patient was anxious, fearing that the scar would open and another hernia occur.

Intervention: tape patterns were used on portions of the scar and the recoil direction was changed. In addition, soft tissue mobilization, fascial releases and oscillations were incorporated and progressive abdominal strengthening exercises were included in the treatment plan. The Vancouver General Hospital Burn Scar Assessment was used to document scar changes and patient's subjective comments were monitored.

Kinesio Tape as a therapeutic tool is relatively new in the United States. In 1995, the tape was introduced in the United States after ten years of successful use in Japan. Kinesio Tape is an elastic tape made from cotton. It has adhesive backing that is heat activated, thus it adheres to the skin for an average of three to five days. There are special principles of application that must be followed for the best results. The tape is cut into specific patterns and applied over tissues at various rates of tension.

Kinesio Tape is comfortable to wear because it is the thickness of skin and it allows air to circulate through its porous fibers. The tape can reduce swelling, enhance muscle action or relax muscles that are tight, and it supplies constant compression on scar tissue. Care must be taken in its application so that blisters do not form from folds or from too much tension on the tape. One must be trained in the use and application of the tape to be most effective.

Outcomes: The pliability, vascularity, height of the scar, pigmentation, and pain relief were improved with the use of the Kinesio Tape. Sensory changes occurred and the patient was encouraged where previously he was anxious about recovery.

Discussion: The use of Kinesio Tape for scar resolution is effective, economical, and is relatively easy to use for caregivers and patients. It is applied and worn 24 hours/day, changed every 3-5 days and one can employ a variety of myofascial techniques to influence tissue changes.

Background:

Brief Description of Wound Healing

All wounds heal in a similar manner. The time it takes to heal varies from one tissue to another. The complexity of the injury, extent of wounds or contamination may alter the timing of healing.

Stages of Healing

The inflammatory phase of healing begins within hours of a trauma and continues for at least three days but may persist for weeks. There is edema, heat, redness and pain. Bacteria and dead cells are removed by leukocytes and macrophages. Fibroblasts follow the macrophages but do not form collagen immediately. The superficial wound begins epithelialization from the margins inward, usually taking three days to seal the wound. The fibroplasia or collagen deposition begins in three to four days; wound contraction occurs reducing the size of the superficial wound. The tensile strength of the wound is very low. Collagen production is active for many months. The third stage of scar maturation or remodeling lasts from three weeks to six months but may last for years. In this stage there is a turnover of collagen to provide the differentiation of the tissue type.

Definition and Description

The first description of abnormal scar formation, in the form of keloids, was recorded in the Smith Papyrus in approximately 1700 B.C. Hypertrophic scars and keloids are included in the spectrum of fibroproliferative disorders. These scars result from the loss of the control mechanisms that normally regulate the balance of tissue repair and regeneration. A hypertrophic scar is one that remains confined to the area of tissue damaged by the original injury, and increases in size by pushing out the margins of the scar, not by invasion of the surrounding normal tissue. There is no genetic, sex, age or racial predilection. These scars appear more commonly in the trunk and extremities.

Hypertrophic scars have seven times greater collagen production than normal; there is an increase in collagenase activity. The scar is elevated above the skin and remains hyperemic (presence of increased amount of blood). Hypertrophic scars are primarily of cosmetic concern; however, they can cause restricted movement of muscles, joints, and tendons. The scars can be painful or pruritic or cause a burning sensation. The most important risk factor for development of abnormal scars is a wound closure by secondary intention, especially if healing time is greater than three weeks. Wounds subjected to prolonged inflammation are at risk of abnormal scar formation.

Mechanical compression dressings have long been known to be an effective form of scar treatment. Reduction of the cohesiveness of collagen fibers in pressure-treated hypertrophic scars has been demonstrated by electron microscopy. The patient starts wearing the pressure garment (24 hours/day) as soon as reepithelization occurs and continues until maturation is evident. The recommended level of pressure is 25 mmHg, but good results have been observed as low as 5-15 mmHg. The mechanism of action is unknown, however, reducing the oxygen tension in the wound causes occlusion of small vessels with subsequent reductions in tissue metabolism, fibroblast proliferation and collagen synthesis.

Case Description

The patient is a 38-year-old male referred to Physical Therapy for scar management and trunk strengthening. The Physician, a Plastic Surgeon, stated that he did not want to do another surgery in the area of the scar.

History: R.S. was diagnosed with a diverticular abscess in 2001 and was conservatively treated. By September 2002 it became necessary to perform a sigmoid colon resection for diverticulitis.



Four months later the patient developed an abdominal hernia for which he underwent hernia repair with a mesh implant on May 23, 2003.



Ten months hence, the patient complained of abdominal tenderness and redness. He was treated with a broad -spectrum antibiotic but his symptoms did not change. On April 13, 2004 the mesh was excised and the wound was left to heal by secondary intention because of the infection.



The healing process began.



The patient was first seen in Physical Therapy on September 21, 2004. The evaluation results were as follows:

Diagnosis: Hypertrophic Scarring of the Abdominal Wall

Pain: 2-5/10 by Visual Analog Scale, worse when sitting straight, bending forward, laughing, coughing or sneezing, better at rest

Length: 10 ¼ " serpentine scar folds noted in left upper quadrant adjacent to scar and right lower one third adjacent to scar

Height: 5mm

Pigmentation: hyper-pigmentation

Vascularity: red

Pliability: Parts of the scar were yielding (giving way to pressure), part was firm (inflexible, not easily moved), center banding (rope-like tissue that blanches with extension of scar)

Abdominal strength: Internal obliques:3-/5

External obliques:3/5

Rectus Abdominis: 3+

Functional Index Scale of Oswestry: 67%



Treatment: Gentle soft tissue mobilization and scar massage, instruction in isometric abdominal tensing, Kinesio Tape along scar applied with patient lying over pillows, distal to proximal application, 10-20% stretch.



The patient was seen twice weekly for monitoring the response of the tissue, progressive exercises and soft tissue mobilization, fascial releases and jiggling. Ken Lamm, P.T, developed the technique of using tacky cloth for oscillation and jiggling to free restriction. It proved to be helpful in increasing the pliability of the scar and surrounding tissue.



As treatment progressed mechanical corrections to the more adhered spots at the midpoint of the scar were introduced. The tape was stretched a bit more by the umbilicus where a thick edge of the scar was folding inward.



By the end of September the vascularity was improving and the scar was less red. The exercises had progressed to include the use of a therapy ball for lower abdominal isometrics. Each week produced subtle changes in the scar, particularly in the suppleness and color. By October the tight skin around the umbilicus resolved and the in folding had decreased. Abdominal recruitment had improved to a visually perceived contraction throughout. The central banding was softening and becoming less cordlike and was half the size.



By 10/12/04 the patient stated he could feel his abdominals contract and sensitivity was decreasing. Tape applications continued with small pieces mobilizing tissue in two opposite directions.



The patient continued the prescribed program which included taping at home between treatments as needed. Vascularity was improved, the center of the scar was pink and the edges were darker. The central banding was half the size and more threadlike than cordlike. The patient reported that he was experiencing more sensation along the scar and that pain occurred with coughing only. Abdominal strength increased to 4- rectus abdominis and external obliques, and 3 for internal obliques. His endurance for trunk exercise was fair. Taping techniques incorporated fascial correction in different directions: across the scar, pulling the folds from opposite directions both vertically and horizontally and small power space corrections were applied over the in-folded areas.



In late November, the patient was concerned about the pain he experienced when coughing. He visited the surgeon to discuss his symptoms. The surgeon reassured the patient that the pain upon coughing or sneezing was indicative of sensory return to the scarred area.

By December 2004 R.S. was able to begin jogging and he stated he could feel his abdominal muscles working. Pigmentation was still hyper but was moving toward normal, vascularity was pink with dark edges, pliability; yielding with threadlike banding, height:<4mm and strength of the abdominal muscles ranged from 3+ to 4. Taping continued as previously described and the patient was using theraband for upper and lower extremities exercises daily.

R.S. continued to progress but changes occurred slowly from November to January. Reevaluation in January produced the following results:

Pain 2/10 when coughs

Height: 2mm Width: .5-2.8 cm at various levels

Vascularity: Pink with darker edges

Pliability: Proximal and distal portions were supple, at skin folds there was firm tissue bound in one direction

Banding: threadlike in the central portion of the scar

Pigmentation: Normal with hyper-pigmentation along edges

Strength: Rectus Abdominis and External Obliques: 4

Internal Obliques: 3+

Functional Index Scale: 86%



The Plan of Care was discussed with R.S. and the decision was made for him to continue Kinesio Tape, massage, and exercise independently. The patient was asked to return for reevaluation every three to four weeks for two months.

Conclusions:

Kinesio Tex Tape is an effective, inexpensive method to treat an extensive hypertrophic scar. The patient's pain decreased, the height of the scar decreased, pliability increased and vascularity stabilized. The patient had a psychological boost when the scar responded within weeks of the initial application; he could see a color change and was more comfortable. Other treatment techniques were

employed concurrently, however, the use of the Kinesio Tape was the most consistent modality used. The cost of using Kinesio Tape is very competitive compared to other forms of scar management including gel sheets, mepiform dressings, and elastomer putty for scar pads.

Discussion Points:

In a Clinical Policy Statement, the Aetna Insurance Company declined to cover fees for the use of silicone products on scars because of lack of evidence that the results were clinically significant. Research must be conducted that measures and compares the results of various products for scar management. The research must be valid, controlled studies in order to be accepted in the medical community and by third party payers.

This case documented impressive results from the use of Kinesio Tape on hypertrophic scar. All the parameters of the Vancouver General Hospital Burn Scar Assessment indicated improvement, and the patient achieved an acceptable level of function as measured by the Oswestry Functional Index Scale. The patient felt encouraged early in the treatment and his pain was relieved. Although the tape was not used in isolation, the regression of the hypertrophic tissue was enhanced. Results were achieved faster than the literature indicates for a scar of this type.

Scar Management Products

Product	Cost/Roll
Kinesio Tape	\$ 15-16.00
Gel Sheets	\$28.95 (4"x4")
Mepiform	\$30.00 (4"x7")
Oleeia Fabric	\$33.00 (3"x4.7")
Other Types:	
Silicone Elastomer	\$126.95
Elastomer Putty	\$34.95 (8 oz.)
Scarfade G	\$29.95-69.9