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Original Research Article

Effectiveness of Kinesio Taping on hypertrophic scars, keloids and scar contractures

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ABSTRACT

Introduction: Hypertrophic scars, keloids and scar contractures result from abnormalities in collagen degradation and synthesis, consequently leading to its overproduction. Such scars not only pose an esthetic problem, but also contribute to functional disorders in the organism.

Aim: This work aimed at presenting the effectiveness of Kinesio Tapes applications in managing scars and keloids as evaluated by patients themselves or carers of children who had undergone such treatment.

Materials and methods: Research was conducted at the Provincial Specialist Children's Hospital in Kielce. The study group comprised 54 children, aged 2–18 years old (average age 6.7 years) with hypertrophic scars, keloids and contracture scars. The first stage of the research involved measuring the scars with a digital caliper and applying Kinesio Tape according to the assumed research methodology. In order to assess patients'/carers' subjective evaluations of Kinesio Taping effectiveness a questionnaire form devised by the authors was used.

Results and discussion: In the study group, 37 patients declared that the application of Kinesio Tapes improved the cosmetic outcome and perception of the scar after 3 weeks; 10 patients who had undergone treatment observed such changes after 6 weeks; 5 patients indicated positive results after 9 weeks, and 2 patients after 12 weeks.

Conclusions: On the basis of the questionnaire results, personal observations and taken measurements, it can be concluded that the application of Kinesio Tapes is effective for hypertrophic scars, keloids and contracture scars.

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1. Introduction

The formation of keloids and hypertrophic scars is associated with an increased collagen synthesis and its reduced degradation. Scars are generally located where tissue tonus is increased. Keloids occur mainly in children and young individuals in association with frequent injuries in earlier periods of life.[6] A normal scar is formed 48 hours following a wound closure and can disappear within 3 months. However, negative external factors and genetic predispositions frequently result in abnormal scarring that can last for up to 18 months, or even continue to form during one's entire life.[4] In predisposed individuals, all healing processes are characterized by an excessive intensity. This contributes to the formation of hypertrophic scars, keloids or scar contractures.[14]

Abnormalities in collagen degradation and synthesis lead to its overproduction. As a result the scar grows uncontrollably, becomes firm and thick, of poor pliability and esthetic effect. Not only is the patient dissatisfied with the treatment outcome, but also such scars frequently lead to deformations, functional disorders and psychological discomfort. Additionally, clinical symptoms appear, such as itchiness, burning sensation, pain or limited mobility.[18,20,21]

Hypertrophic scars develop in a relatively short period of time following a skin injury, within 4–8 weeks, and do not grow beyond the boundaries of the original wound. This type of scar is characteristic for young individuals, scalded patients and individuals with dark skin. Such scars are generally reddish, with a thick, raised texture. They usually develop as a result of a prolonged healing process (Fig. 1).[7]

Keloids always grow beyond the boundaries of the original wound margin and continue to grow with time. Unlike hypertrophic scars, keloids do not spontaneously flatten or regress. These are firm, raised, rounded and irregular nodules of scar tissue, accompanied with pain and itchiness when forming, which frequently reappear following their incision (Figs. 2 and 3).[7]

Scar contractures result from serious injuries associated with extensive skin deficiencies, usually following large and severe burns. The contracture can affect the underlying muscles and tendons, thus seriously limiting joint mobility and leading to disorders in the functioning of the muscular system with associated fasciae (Figs. 4 and 5).[10]

Fig. 1 – Hypertrophic scar.

Fig. 2 – Keloidal scars.

Fig. 3 – Keloidal scar.

Fig. 4 – Contracture scar.

Fig. 5 – Contracture scar.

Scar management is a serious challenge despite the application of various treatment modalities. Both pharmacological and physical therapies, as well as surgical methods are employed with varying outcomes and effectiveness.[19] Surgical procedures, frequently termed as methods involving tissue discontinuity, include: cicatrectomy and repeated suturing, scar revision with skin flaps relocation, steroid injections, cryosurgery, chemical peel, microdermabrasion, mezotherapy, high intensity laser therapy.[5] One of the methods that can bring beneficial outcomes and help to avoid surgical interventions is Kinesio

Taping. This method is based on kinesiology and the self-healing abilities of the organism. It takes advantage of the physical properties of the elastic therapeutic tape and specific methods of its application.[2,15] The tape has properties similar to those of human skin; it extends up to 30–40% of its original resting length, allows for the evaporation of sweat, and its thickness is similar to that of the epidermis.[2] The basic functions of the tape include: conscious normalization of muscle tone, activation of injured muscles, correction of joint position, improvement of the lymphatic function resulting in the reduction of edema, reduction of pain and oversensitivity in the involved skin and muscles, correction of the position of the fasciae and skin.[12,13] Appropriate applications of Kinesio Tapes can improve both the appearance and perception of the scar, as well as reduce a patient's functional and emotional limitations associated with the existing scars.[21]

2. Aim

This work presents the effectiveness of Kinesio Tape applications in managing hypertrophic scars, keloids and contracture scars as evaluated by patients themselves and parents or carers of children who had undergone such treatment.

3. Materials and methods

Research was conducted at the Provincial Specialist Children's Hospital in Kielce. The study group comprised 54 children, aged 2–18 years old (average age 6.7 years) with hypertrophic scars, keloids and contracture scars. All subjects volunteered to participate in the research. The first stage involved the application of Kinesio Tapes over scarred skin. The tape was applied on condition that the wound was completely healed, bearing no traces of breakages or crusts that form a natural biological dressing. The tape was applied to clean, degreased skin. On average the tape remained for 7 days. The length of a single tape application depended on the scar type, its location and external factors, such as the absence of protection against strap removal or the effect of water during every day hygiene activities. Intervals between consecutive applications lasted for 3–4 days. In specific cases, the application was modified in order to eliminate the existing restrictions of muscles and fasciae.

Kinesio Tape application techniques depended on the scar type, its size and existing disorders of muscles and fasciae. The major aims of the tape application involved eliminating such limitations and achieving multidirectional skin motion as well as flattening the scar, reducing its color intensity and size (Figs. 6–9).

The stretch of the tape ranged from 25% to 100% and depended on an individual evaluation by the physiotherapist. The applications were employed for 12 weeks. The effectiveness of Kinesio Taping was verified every 3 weeks on the basis of the patient's or carer's subjective evaluation. To this end, a questionnaire survey form devised by the authors was employed, consisting of 19 close (single choice and multiple choice) and open questions. The questionnaire form allowed the respondents to provide the following

Fig. 6 – Scar before the application of Kinesio Tape.

Fig. 7 – Scar with applied Kinesio Tape.

Fig. 8 – Scar after 6 weeks of Kinesio Tape application.

Fig. 9 – Scar after 12 weeks of Kinesio Tape application.

information: location, type and circumstances associated with the scar formation (questions 2–4); functional limitations caused by the scar (questions 5–6); type and effectiveness of the hitherto applied treatment (questions 7–10); multidimensional effectiveness of the applied Kinesio Taping (questions 11–19).

The elevation of the scar during the application of Kinesio Tapes was measured by employing a digital caliper, without pressing the scar to the patient's body. Observational error was assumed to be less than or equal to 0.2 mm. The mobility of the affected skin, ranging from 100%, 50% and 25%, and the skin color were estimated in relation to the symmetrical location on the patient's body.

4. Results

In the study group, the majority of scars resulted from thermal burns – 31 (57%); in 7 (13%) cases scars formed postoperatively; in 2 (4%) cases they were caused by chemical burns; and in 14 (26%) patients as a result of other injuries (Fig. 10). In 22 (41%) cases the scars were keloidal; scar contractures occurred in 20 (37%) patients, and in 12 (22%) cases the scars were hypertrophic (Fig. 11). All patients treated with Kinesio Taping reported clinical symptoms such as pain and an absence of skin motion within the involved site. The location of scars in clearly visible parts of the body additionally contributed to a poor cosmetic effect. In 28 patients the scars caused limited mobility in daily activities. Such dysfunctions were not detected in 26 patients. Prior to the application of Kinesio Tapes, the patients had undergone various forms of targeted conservative treatment: cream applied to the involved skin, compression garment, laser, jonophoresis (19 patients); cream applied to the involved skin, laser, silicone (11 patients); cream applied to the involved skin and laser (11 patients); cream applied to the involved skin (13 patients).

In the study group, the application of Kinesio Tapes effected the change in the appearance and perception of the scars in 37 patients after 3 weeks; 10 subjects noticed such changes after 6 weeks; 5 patients reported positive changes after 9 weeks, and 2 patients after 12 weeks of applications (Fig. 12). As many as 37 subjects, with scars not older than 1 year, declared a noticeable improvement within 3 weeks following the beginning of Kinesio Tape applications. The remaining 17 patients, with scars older than 1 year, detected improvement in a period ranging from 3 to 12 weeks following the beginning of treatment. Concerning scar appearance, among 34 patients with keloids and hypertrophic scars, after a 12-week treatment, in 17 patients the scar height was reduced to 2 mm; in 10 patients the scar height was reduced by 1 mm, and in 7 cases no difference in this respect was noticed. The change in color intensity from bright red to light pink was evaluated by means of a 4-point satisfaction scale by the patient/carer. In total, 22 patients assessed the color change as significant, 18 patients as average, 11 patients as satisfactory, and 3 as unsatisfactory (Fig. 13). With reference to scar tissue mobility following Kinesio Taping, 33 patients indicated a 50% improvement; 100% scar mobility was observed in 15 patients; in 6 cases scar mobility improved by 25% (Fig. 14). When evaluating the level of satisfaction with respect to Kinesio Taping outcomes, 42 patients declared 100% satisfaction with this method; in 8 cases the satisfaction level was assessed as 50%, and in 4 as 25% (Fig. 15).

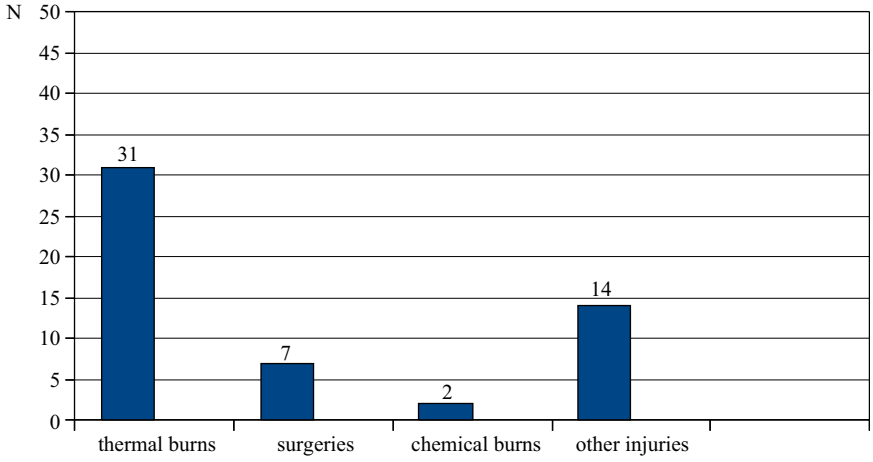

Fig. 10 – Causes of scar formation in the study group.

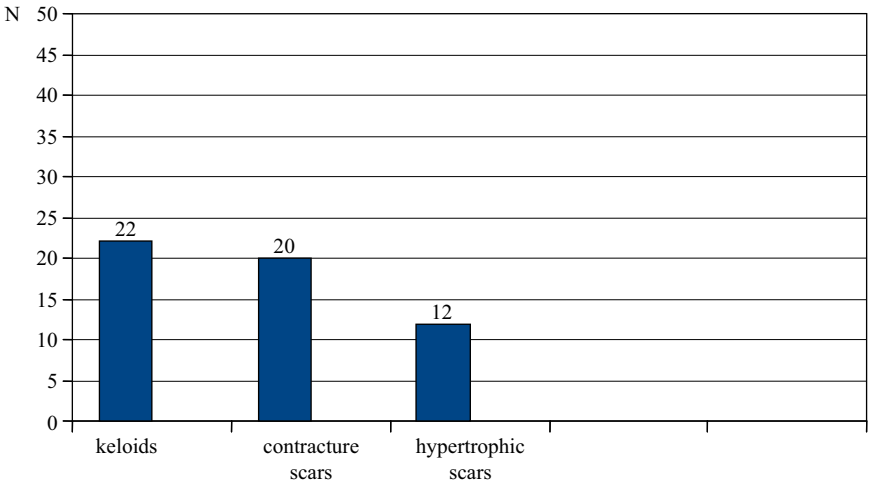

Fig. 11 – Type of scars observed in the study group.

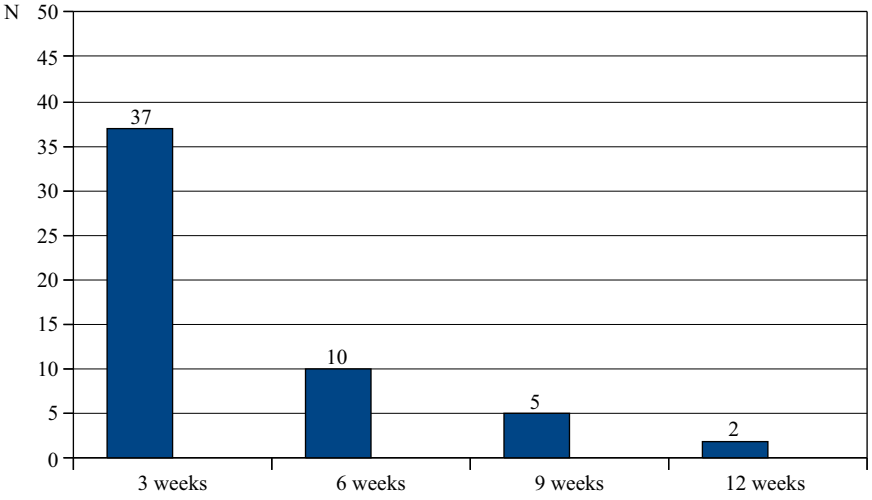

Fig. 12 – Period after which improvement (appearance and perception of the scar) was detected following Kinesio Tape applications.

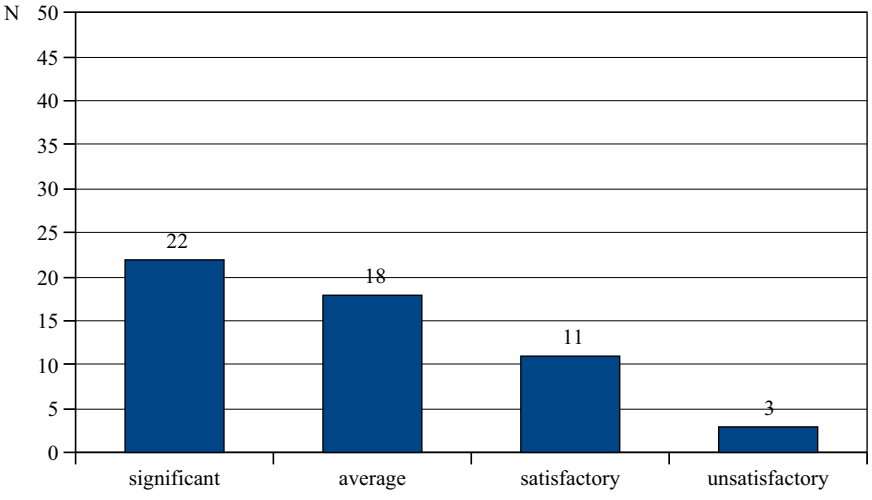

Fig. 13 – Change in scar color intensity following Kinesio Tape applications.

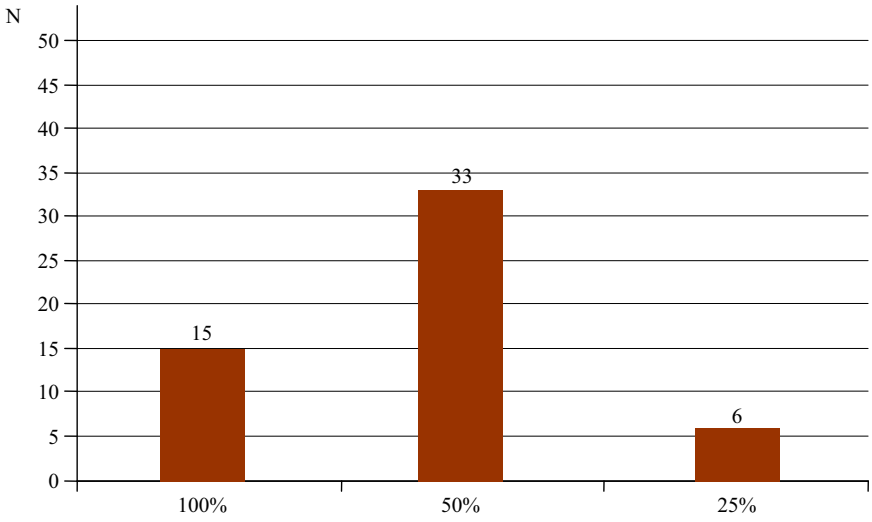

Fig. 14 – Improvement in scar mobility following Kinesio Tape applications.

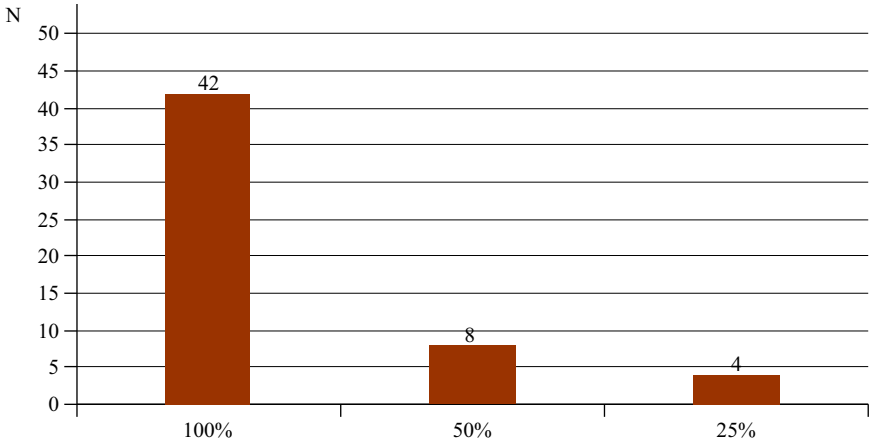

Fig. 15 – Patients' satisfaction following Kinesio Tape applications.

5. Discussion

Pathomechanism involved in the formation of keloids and hypertrophic scars is complex. Tissue healing frequently becomes complicated and is inhibited at the initial stage, i.e., the stage of inflammation and development of granulation tissue.[16,17]

This implies that the most frequently applied treatment involves targeted therapy, dependent on the clinical assessment of the scar, including its location, size and time elapsing from its formation.[8,21] Most common treatment methods include: surgical treatment, pharmacological therapy, e.g., corticosteroid injections, and physical therapy methods, including cryotherapy, laser, compression, deep oscillation and lymphatic drainage according to Asdonk.[6,17] Small and single scars are treated by corticosteroid injections, cryotherapy and adjuvant drugs. Large scars are managed by multiple methods.[13] Silicone elastomers are also employed in managing scars – as a method for facilitating wound healing and reducing the risk of hypertrophic scars.[11]

In medical literature there are very few papers concerning the application of Kinesio Tapes in the management of scars and keloids. Atkinson et al.[1] studied 70 patients who had undergone cesarean section and were subsequently managed with Kinesio Taping. The tape was applied for 12 weeks. In the study group no scars were formed. At 12 weeks after surgery, 41% of the control group developed hypertrophic scars. The authors indicated that Kinesio Tape application is likely to be effective for the prevention of scarring. Goodridge presented a case report indicating the effectiveness of Kinesio Taping.[9] The study involved the application of Kinesio Tape to manage a hypertrophic abdominal scar resulting from 3 surgeries. Treatment reduced the height of this scar to 2 mm, effected a change in the scar pigmentation, improved pliability and motor functions, and significantly reduced pain. The results of treatment involving Kinesio Tape were also presented by Branstiter.[3] The applied therapy resulted in muscle and fascia relaxation, increased lymphatic flow, complete reduction of edema. The scar turned into a thin, light line.

On the basis of the questionnaire survey, measurements taken with digital calipers, and personal observations, it can be concluded that Kinesio Taping is highly effective with respect to hypertrophic scars, keloids and contracture scars. Significant therapeutic outcomes were observed both in

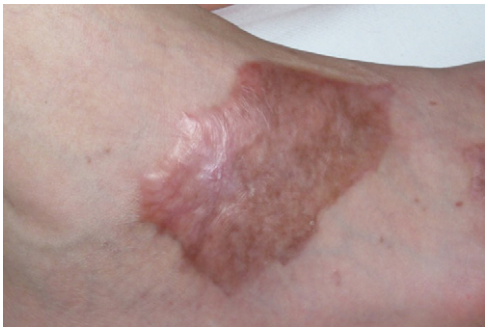

Fig. 16 – Scar before the application of Kinesio Tape.

Fig. 17 – Scar after 3 weeks of employing Kinesio Tape.

Fig. 18 – Scar before the application of Kinesio Tape.

patients with an active overproduction of collagen and in patients with old, already formed hypertrophic scars. The number of applications after which an evident positive cosmetic outcome and improvement in the perception of the scar were observed differed among patients.

In the group of patients with new scars the outcome was evident already after the first application. Patients with older scars reported changes after a series of 3–4 applications. Both study groups indicated that scars became brighter, softer and less elevated. Changes involving scar mobility were also observed; the pulling sensation was reduced and the range of motion of the involved joint was improved (Figs. 16–19).

Fig. 19 – Scar after 6 weeks of employing Kinesio Tape.

This study justifies the conclusion that Kinesio Taping is an important element in the process of managing keloids as well as hypertrophic and contracture scars.

6. Conclusions

1. Kinesio Tape applications contribute to a positive cosmetic outcome and reduce limitations with respect to scar mobility, which confirms the validity of introducing this form of treatment as one of the methods for scar management.
2. Kinesio Taping is a low cost, noninvasive method which yields good outcomes in managing hypertrophic scars, keloids and contracture scars in a short period of time.

Conflict of interest

None declared.

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