



## Skin irritation incidence following kinesiology tape use in patients with neurological disorders: multicenter observation

Częstość występowania podrażnienia skóry po użyciu plastrów do kinesiotalingu u pacjentów z zaburzeniami neurologicznymi: obserwacja wieloośrodkowa

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### ABSTRACT

**INTRODUCTION:** Kinesiology taping can be used as an independent or supportive method in rehabilitation. It can be utilized for many injuries, disorders and diseases. The aim of this observational study was to record the incidence of contact allergies or other adverse skin changes amongst patients with neurological disorders treated with kinesiology tape.

**MATERIAL AND METHODS:** One hundred and sixty patients from four countries (Poland, Spain, England, Holland) both females and males, treated with kinesiology tape were included. The second author (Poland) looked for skin reactions during each new application. In the other three countries (Spain, England, Holland) therapists initiated tape application and parents or caregiver's reported to the first author by means of an online questionnaire.

**RESULTS:** The incidence of skin reaction was 9.38%.

**CONCLUSIONS:** Despite the fact that kinesiology taping is regarded as an effective, safe and patient-friendly treatment, there is still need for careful application. This is especially the case in neurological patients with possible sensory deficits and/or patients in a (sub)conscious state. Increased awareness of possible allergic (contact dermatitis) reactions should increase the safety of this method.

#### KEY WORDS

physiotherapy, safety, rehabilitation, Kinesiology Taping, skin preparation, tape properties

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## STRESZCZENIE

**WSTĘP:** Kinesiotaping może być wykorzystywany jako samodzielna lub uzupełniająca metoda rehabilitacyjna. Jest przydatny w wielu urazach, zaburzeniach i schorzeniach.

Celem badania jest zarejestrowanie częstości występowania alergii kontaktowych lub innych niekorzystnych zmian skórnych w grupie pacjentów z deficytem neurologicznym poddawanych terapii tą metodą.

**MATERIAŁ I METODY:** Do badania włączono 160 pacjentów z czterech krajów (Polska, Hiszpania, Wielka Brytania i Holandia), kobiet i mężczyzn, poddanych terapii z wykorzystaniem kinesiotapingu. Drugi autor (Polska) samodzielnie badał reakcje skórne podczas każdej nowej aplikacji, natomiast w pozostałych trzech krajach (Hiszpania, Wielka Brytania, Holandia) terapeuci zaczęli oklejanie, a rodzice/opiekunowie relacjonowali pierwszemu autorowi jego efekty za pomocą kwestionariusza internetowego.

**WYNIKI:** Częstość występowania reakcji skórnych wyniosła 9,38%.

**WNIOSKI:** Pomimo faktu, że wykorzystanie plastrów do kinesiotapingu jest uważane za efektywną, bezpieczną i przyjazną dla pacjenta formę terapii, ciągle istnieje potrzeba uważnej aplikacji plastra. Nabiera to szczególnego znaczenia u pacjentów neurologicznych, z możliwymi deficytami czucia, i/lub pacjentów z zaburzeniami przytomności. Zwiększona świadomość dotycząca możliwości wystąpienia reakcji alergicznych (alergii kontaktowej) powinna podwyższyć bezpieczeństwo omawianej metody.

## SŁOWA KLUCZOWE

fizjoterapia, rehabilitacja, kinesiotaping, bezpieczeństwo, przygotowanie skóry, właściwości plastra

## INTRODUCTION

Kinesiology taping (KT) can be used as an independent or adjunct modality in rehabilitation. It has been perceived to be very useful in treating many musculoskeletal injuries and disorders or diseases [1,2,3,4,5,6,7,8,9]. Current evidence into its effects are regarded as insufficient [10,11,12,13,14,15]. Even though many health professionals use tape on patients with neurological disorders, studies into the effectiveness in this group is lacking. Many studies have investigated the underlying mechanisms and the resulting therapeutic effects on strength, pain, gait, motor performance and proprioception [16,17,18,19,20,21,22,23,24]. However, there is still need for further research. There are very few studies in the area of safety and hypoallergenic characteristics of kinesiology tape [25,26]. Evidence of allergy to kinesiology tape (burns, rashes) in clinical practice is rare and there is a definite lack of research in this area [27,28]. This topic is underrated at this moment. Contact dermatitis due to the tape's dye, glue and possibly colour has been observed by both authors. The case of a 23-year-old man with diagnosed tetraplegia was described earlier [29]. The aforementioned skin problems have been observed by other professionals as well [30]. Both authors have conducted clinical research into the effect of applying tape onto tattoos and they have found that even after extended application time, no skin irritations were ever observed. However, according to Simunovic C, Shinohara MM, tattoo-related skin infections can be seen from days to decades after tattooing, and they range from acute pyogenic infections to cutaneous

tuberculosis [31]. No research into the safety of taping on tattoos has been conducted. To our knowledge no research into the safety of taping on moles or skin markings has been conducted so far. Awareness of the risk factors, skin condition and understanding of the importance of monitoring and proper test-patch use should increase the efficacy and safety of tape applications [32]. The aim of this research was to record the incidence of contact allergies and other adverse skin reactions among patients with neurological disorders treated with kinesiology tape.

## MATERIAL AND METHODS

An observational retrospective open before-after study (BAS) was conducted in four countries (Poland, Spain, England and Holland) from 2010–2014. One hundred sixty patients (mean age  $34.02 \pm 15.51$ ), both female (48.75%) and male being treated with kinesiology tape participated. Skin condition was monitored during therapy sessions. The inclusion criteria were as follows: age from 2 years old, lack of skin disorders or active skin changes, irritation, etc., lack of contraindications to kinesiology tape (health history records confirmed with patient interview) and taping goals (addressing drooling, pain, balance, muscle weakness, inflammation, stabilizing and supporting joints, areas of injury prevention etc.). The patient's overall profiles are presented in Table I.

The convenience sample was used as the participant recruitment procedure. Patients receiving therapy including kinesiology taping were asked to participate



in the study. Parents or guardians gave the consent to participate in the case of infants. Most patients suffered from various neurological conditions (stroke, spinal cord injuries SCI, traumatic brain injuries TBI) and genetic disorders (Rett syndrome, Down syndrome, brain agnesia, microcephaly). The effectiveness of KT in patients suffering from the above disorders and syndromes has been investigated and published [33,34,35,36,37,38,39,40,41,42,43,44]. In a number of countries, kinesiology taping has become a routine procedure for certain disorders in both hospitals and outpatient clinics.

**Table I.** Patients' overall profile for whole group and four subgroups (from Poland, Spain, England and Holland)  
**Tabela I.** Charakterystyka pacjentów w całej grupie oraz w czterech podgrupach (z Polski, Hiszpanii, Wielkiej Brytanii i Holandii)

Whole group	
Age [years]:	Number and percentage (N = 160)
Min	2
Max	85
SD	15.51
Mean	34.02
Median	32
Subgroup from Poland	
Age [years]:	Number and percentage (N = 100)
Min	30
Max	85
SD	15.2
Mean	52.12
Median	54
Subgroup from Spain	
Age [years]:	Number and percentage (N = 36)
Min	3
Max	50
SD	12.70
Mean	13.72
Median	8
Subgroup from England	
Age [years]:	Number and percentage (N = 13)
Min	3
Max	42
SD	13.68
Mean	14.15
Median	10
Subgroup from Holland	
Age [years]:	Number and percentage (N = 11)
Min	2
Max	75
SD	22.64
Mean	25.18
Median	18

In Poland, the application of KT was performed by K-Active Association certified therapists with  $\geq 5$  years of experience in KT and  $\geq 15$  years of experience in the physical therapy of patients with neurological disorders. Taping was applied according to the require-

ments and current best knowledge. This is considered useful for replication and further compartmental studies. In a 4–6-week treatment period, patients received various KT applications depending on the patient (Tab. II). Two KT brands were used: Nitto Denko and Kinesio Tex Gold. The areas of application and taping goals varied per patient and due to the variability of the patients' conditions, different KT techniques were applied. The tape sizes varied from 1 x 3 cm to 5 x 60 cm. Every patient from Holland, Spain and England received the same tape application (sizes differed slightly). Patients and caregiver's were instructed by a Medical Taping Concept certified therapist and instructor (47 years of experience in physical therapy) and they then took over the procedure. At least three KT brands were used: CureTape, Gentle from Nitto Denko and Kinesio Tex Gold. It is possible that another brand was also used. In Poland black, blue, red or beige tapes were used randomly. In Spain, England and Holland beige tape was recommended only. One patient used a coloured tape (pink then blue of an unknown brand). In all the countries a tape free interval is standard procedure. If secondary skin reactions were identified, a minimum one day tape-free interval between applications was implemented in Poland.

**Table II.** Differences in application per country  
**Tabela II.** Różnice w aplikacjach w zależności od kraju

Country	Size applied	Tape brand & colours	Application frequency	Total treatment time	Body parts
Poland	Between 1 x 3 cm & 5 x 60 cm	Kinesio Tex & Nitto Denko Colour: black, blue, red, beige	Daily 2–3 x week 4-da application	4–6 weeks	UE, LE, trunk, face
Netherlands	Between 1 x 3 cm & 2 x 5 cm	Curetape & Nitto Denko & unknown Colour: beige	Daily 2 x week 3 x week	4 weeks	chin
Spain	Between 1 x 3 cm & 2 x 5 cm	Curetape, & Nitto Denko & Kinesio & unknown Colour: beige	Daily 2 x week 3 x week	4 weeks	chin
United Kingdom	Between 1 x 3 cm & 2 x 5 cm	Curetape & Nitto Denko & unknown Colour: beige	Daily 2 x week, 3 x week	4 weeks	chin

UE – upper extremity  
LE – lower extremity

For research purposes and to avoid misunderstanding, we have defined the observed skin changes as:

- rash: skin redness, heat (red patch);
- chafe: scald, nappy rash, result of (relatively) long-term irritation in a wet and warm environment;
- wound.



Such detailed descriptions are needed for standardization (compartmental studies) and quality of KT intervention analysis in future randomized controlled trials (RCTs).

**Table III. ETED Questionnaire**  
**Tabela III. Ankieta ETED**

**Elastic Tape application Excessive Drooling Questionnaire ETEDQ-A**

A = questionnaire used before initiating tape application  
B = questionnaire after 1 month of tape application  
C = questionnaire after 3 months of tape application  
D = questionnaire after 6/7 months of tape application  
E = questionnaire after 1 year of using tape

I. Child's or adult's initials

II. Date of Birth

III. Diagnosis

IV. GMFCS Gross Motor Function Classification System.  
www.canchild.ca Level 1 II, III, IV, V & unknown

**ETED Questionnaire**

1. Drooling frequency: Average over past week
    - no drooling – dry
    - occasional drooling – not every day
    - frequent drooling – every day but not all day
    - constant drooling – always wet
  2. Drooling severity: Average over past week
    - dry – never drools
    - mild – only lips are wet
    - moderate – wet lips and chin
    - severe – drools so much that clothes and/or objects get wet
    - profuse – clothing, hands and objects become very wet
  3. How many times were bibs changed on average per day (home or institution)?  
Scale 1, 2, 3, 4, 5, 6, 7, 8 times
  4. How many changes of clothes were necessary per day (home or institution)?  
Scale 1, 2, 3, 4, 5 times
  5. How offensive was the smell of the saliva?  
Scale: 0 = not offensive 10 = very offensive
  6. Are there problems with rashes around the mouth or chin?  
Scale 0 not at all – 10 all the time
  7. Is your child/are you embarrassed because of the drooling?  
Scale 0 = not at all – 10 = all the time
  8. How frequently do you have to wipe your child's/your mouth?  
Scale 0 = not at all – 10 = all the time
  9. How frequently do you have to wipe saliva from toys or other items?  
Scale 0 = not at all – 10 = all the time
  10. Does your child/do you have a problem with coughing or choking on saliva?  
Scale 0 = not at all – 10 = all the time
- V. Informed consent to use information from this study for educational purposes. Parents/patients declare that they are aware of and consent to the above information being used for educational purposes and possible publication. Full anonymity will be warranted by Esther de Ru  
Yes/No
- VI. Please leave your comments about the treatment and effects here.
- VII. Did you receive a tape application information sheet?  
Yes/No
- VIII. Did you receive the tape satisfaction questionnaire?  
Yes/No
- IX. Email address for further contact and/or questions.

In Holland, Spain and England, the Patient Outcome Measure, Elastic Tape Application Excessive Drooling Questionnaire (Table III ETEDQ) was used to gather

information. Tape was applied according to the S-tape Protocol. Informed consent of the patients was thereby provided. Data was collected up to one month after the first tape application. Statistical analysis was provided using Statistica 10 software. We did not observe missing or incomplete data.

Eligibility criteria were fulfilled by providing therapy (assessment and first application of tape) by an experienced therapist certified in taping techniques.

## RESULTS

The incidence of skin reactions was 9.38%. The results are presented in Table IV. Skin reactions were observed to remain visible from 1–28 days.

**Table IV. Results for whole group of patients and each subgroup**  
**Tabela IV. Wyniki dla całej grupy i każdej z podgrup**

	Number of patients	%
<b>Whole group</b>		
Total number of patients	160	100
Number and percentage of patients with skin reaction	15	9.38
<b>Subgroup from Poland</b>		
Total number of patients	100	100
Number and percentage of patients with skin reaction	11	11
<b>Subgroup from Spain</b>		
Total number of patients	36	100
Number and percentage of patients with skin reaction	3	8.33
<b>Subgroup from England</b>		
Total number of patients	13	100
Number and percentage of patients with skin reaction	0	0
<b>Subgroup from Holland</b>		
Total number of patients	11	100
Number and percentage of patients with skin reaction	1	9.09

## DISCUSSION

The results of this study (9.38% incidence) show lower outcomes than in the recent Polish study [25], where the incidence of skin reactions was reported to be 13.33%, but it is still regarded as high. The lower incidence may be a result of; increased awareness among therapists, better training of families/caregivers and careful treatment and skin care of patients at risk. It could also have been influenced by the tape colour and the amount of stretch used. Patients with an increased



risk for skin damage are patients with Disorders of Consciousness (DoCs) and patients with severe sensory deficits. Lack of proper ventilation and excessive humidity under and around the application may become a problem especially in a very warm environment (e.g. warm summers). Hyperhidrosis can develop around the tape application and is especially associated with a lack of air flow (shoes, orthotics, skin pleats axilla, abdomen, etc.). It has also been observed in applications on the hands and feet of patients suffering from spasticity.

The presented cases indicate the necessity for further detailed research, especially investigation into the area of possible contraindications for kinesiology taping. Further study is recommended to determine the possible sources of the observed negative skin reactions. Tape brands could be compared and research into allergy to the glue, substances in the tape preparation products and to the combination of substances in both the glue and skin products are needed. More detailed analysis of the tape material and glue composition was conducted in our earlier publications [27,45].

Further studies should demonstrate the efficacy of the strategies to eliminate the risk. The risk factors can be eliminated by: conducting a patch test before treatment

- testing two or three brands on every patient,
- applying tape on very clean skin,
- using high quality brands with medical glues,
- not leaving tape on for long periods of time,
- frequent and careful skin observation,
- avoiding high temperatures (sun bathing, overheating in bed),
- using more than one brand and swapping brands after a longer application time,
- using very little to no stretch when applying tape.

The importance of educating health professionals concerning the following is emphasized:

- thorough assessment of medical history: allergenic problems, sensory deficits and comorbid conditions effecting the skin (obesity, urinary or faecal incontinence, diaphoresis, diabetes mellitus, age of 75 years or older, functional limitations);
- proper skin care: especially at high temperatures and in moist surroundings;
- careful observation of patient's skin during the whole tape application time.

As allergies may cause cutaneous lesions and wounds, research into this area is necessary. Acute allergic reactions, especially in patients with paralysis or in a (sub)conscious state may lead to severe wounds and bedsores, creating secondary complications.

The convenience sample of the population in the study is likely to be skewed and not completely representative. This constitutes the main limitation of our research. On the other hand, the authors assume that the

researched patients are typical of many patients treated in rehabilitation, hospital and medical centers. The variety of therapeutic approaches and actual tape applications in the four countries increases the clinical relevance of our outcomes – our results can be directly compared with findings in everyday clinical practice. It could be relevant for every other patient with skin problems. Another limitation of our research may be perceived as a lack of assessment of inter-rater reliability. Moreover, skin reactions are not the same on different parts of the body. This problem of heterogeneity of the sample should be solved before further studies.

Recent research by Beuted & Cardone showed the poor quality of internet publications concerning KT [46]. There is need to provide appropriate high quality information and coherent content of data bases, especially for patients, their families and caregivers. There are still few relevant publications claiming that elastic taping has proven to be very effective and useful in contemporary rehabilitation.

Further research is needed to further verify our findings and establish the most effective manner to detect patients at risk in an early stage to prevent skin problems. Research into the possible negative effects of applying tape on tattoos should also be conducted. There is a need for clear clinical procedures and protocols within everyday clinical practice. Both authors consider the possibility of standardizing the tape brand, colour, tape stretch and application style to be of importance, especially in patients with sensitive skins. Checking the tattoo carefully for any visible skin changes is recommended. If they appear, we recommend sending the patient to the doctor, ask for a skin biopsy and definitely not to apply tape to this area. We strongly suggest these topics be looked into as soon as possible.

The study states that knowledge of the risk factors for skin reactions will improve skin integrity and safety. In light of the number of adverse skin reactions, reducing the risk factors, checking medical history, appropriate skin care and careful observation of the patient's skin is of clinical importance.

## CONCLUSIONS

Despite the fact that kinesiology taping is regarded as an effective, safe and patient-friendly treatment, there is still need for careful application. The reported incidence (9.38%) may be still regarded as high. This is especially the case in neurological patients with possible sensory deficits and/or patients in a (sub)conscious state. Increased awareness of possible allergic (contact dermatitis) reactions should increase the safety of this method. The results of the study could be



relevant to all patients with skin. Every taping course should include comprehensive information on this subject. Tape manufacturers should be open about the glue content. Research into skin reactions, tape glue

content and the possible negative effects of taping on tattoos should be conducted and widely published.

#### Author's contribution

Study design – E. de Ru, E. Mikołajewska  
Data collection – E. de Ru, E. Mikołajewska  
Data interpretation – E. de Ru, E. Mikołajewska  
Statistical analysis – E. de Ru, E. Mikołajewska  
Manuscript preparation – E. de Ru, E. Mikołajewska  
Literature research – E. de Ru, E. Mikołajewska

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