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Sukces czy porażka? Czyli jak wygląda sytuacja w zakresie szczepień ochronnych w Polsce?

Cztery uczelnie – Centrum Medyczne Kształcenia Podyplomowego, Warszawski Uniwersytet Medyczny, Akademia Leona Koźmińskiego i Uniwersytet SWPS zorganizowały konferencję naukową w ramach Projektu „Budowanie zaufania do szczepień ochronnych z wykorzystaniem najnowszych narzędzi komunikacji i wpływu społecznego".

Podczas czterech paneli dyskusyjnych eksperci, naukowcy, lekarze, psycholodzy, przedstawiciele instytucji publicznych dyskutowali na temat szans i wyzwań stojących przed system szczepień w Polsce.

Nie da się zaprzeczyć faktom – szczepienia ochronne są najefektywniejszą metodą zwalczania chorób zakaźnych. Podnoszenie zaufania do szczepień, które przekłada się na poziom wyszczepienia populacji, jest więc kluczowym wyzwaniem stojącym przed wszystkim odpowiedzialnymi za zdrowie publiczne w Polsce.

Dużym sukcesem i krokiem w dobrym kierunku było wprowadzenie szczepień w aptekach – podkreślił prof. Jarosław Pinkas, Konsultant Krajowy w dziedzinie zdrowia publicznego.

Niemniej, mimo szeroko prowadzonej kampanii medialnej, Polska należy do krajów o najniższym poziomie wszczepienia przeciw COVID-19 w Europie (niespełna 60% populacji zostało w pełni zaszczepionych). Co roku w naszym kraju przeciw wirusowi grypy szczepi się jedynie 4-6% osób. Według danych PZH-NIPZ liczba uchyleń od szczepień obowiązkowych wśród dzieci w okresie od 2016 do 2020 roku wzrosła 2-krotnie z 23 tys. do 50.5 tys.

„Szczepienia przeciwko grypie u pracodawców bardzo zmniejszają absencję w pracy, ta sama prawidłowość dotyczy szczepień rotawirusowych" – mówił prof. Marcin Czech

Z danych uzyskanych przez Warszawski Uniwersytet Medyczny wynika, że postawy mieszkańców Polski wobec szczepień nie są spójne. Może to w przyszłości spowodować dalszy spadek poziomu wyszczepienia populacji, a w dalszej perspektywie wzrost zagrożenia epidemiologicznego.

W ramach panelu prowadzonego przez Uniwersytet SWPS zastanawiano się nad przyczynami postaw wobec szczepień. Pierwszym skojarzeniem, jakie większość Polaków wypowiada po haśle „szczepienia" jest „koronawirus". I choć rzeczywiście od końca 2020 roku szczepienia przeciwko COVID-19 stały się jednym z bardzo ważnych elementów debaty publicznej, to przecież rosnąca liczba osób uchylających się od szczepień na takie choroby jak odra czy krztusiec była ważną kwestią społeczną już przed marcem 2020 roku.

Jednym z kluczowych wyzwań stojących przed system szczepień w Polsce jest walka z fake newsami, podkreślali eksperci Akademii Leona Koźmińskiego.
Czy dezinformację naukową można interpretować w kategoriach cyberwojny?
Czy jest to zagrożenie porównywalne z katastrofą klimatyczną, bądź rozwojem technik AI? Jaką rolę odgrywają w tym procesie media społecznościowe? To pytania z którymi musimy się jak najszybciej zmierzyć.

Mimo wszystko wysoka wyszczepialność w Polsce to sukces wszystkich profesjonalistów medycznych i osób działających na rzecz zdrowia publicznego. Wciąż zdecydowana większość Polaków dokonuje właściwych wyborów zdrowotnych. To optymistyczny wniosek płynący z konferencji CMKP, WUM, SWPS i ALK. Jednak nic nie jest dane raz na zawsze – pojawiające się wyzwania powinny mobilizować lekarzy, naukowców, edukatorów, przedstawicieli administracji publicznej do szukania nowych sposobów dotarcia z komunikatem zachęcającym do szczepień i podejmowania zdecydowanych działań na rzecz walki z dezinformacją.

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The assessment of the early rehabilitation's impact on the level of disorders occurring and the process of reinnervation, on the example of facial twigs of the motor nerve in patients with craniofacial injuries

Ocena wpływu wczesnej rehabilitacji na poziom występowania zaburzeń i proces reinerwacji na przykładzie gałązek ruchowych nerwu twarzowego u pacjentów po urazach twarzowo-czaszkowych

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Abstract

Introduction. Lymphoedema of the skull's facial part is one of the main complications observed in a patient after surgical treatment of disorders of this area. Another noticeable and frequently reported complication by the patient is irregularities in facial expression muscles' work. A relationship between them and reducing edema performed in patients in the first days after surgery will reduce the noted disturbances in motor branches' function.

Aim. To investigate the impact of early swelling reduction on the extent of nervous system disorders and its reinnervation rate.

Materials and methods. Patients of the Maxillofacial Surgery Clinic of the University Clinical Hospital of the Military Medical Academy in Łódź were enrolled in the study. The study was conducted on 60 people who underwent maxillofacial surgery procedures from February to December 2019. Lymphatic drainage and dynamic taping were used to reduce patients' edema. Forty-five people were divided into three equal groups. Fifteen patients constituted the comparative group. The research tools were a survey created following the author's idea, linear measurements for measuring edema, and the Pietruski scale for assessing the state of reinnervation imaged by mimic muscle motility. On the first day after surgery, patients were examined four times, then on the third and seventh day after surgery, and finally four months after surgery.

Results. The use of anti-edema therapy noticeably (from 2-5 points on the Pietruski scale) reduces the disturbances in facial expression muscles' function. The difference has been visible already on the third day after surgery. Regarding the patient's pain, the lack of manual lymphatic system development resulted in pain sensations remaining in each of the three tests performed. The occurrence of edema, pain level, and level of facial expression muscle disorders were similar between groups and made the following research objective in terms of observed relationships.

Conclusions. The level of disturbances in the area of the mobility of expressive facial muscles (based on Pietruski scale) indicates that the implementation of anti edematous therapy, and thus the reduction of excess lymph, already in the first days after surgery provides a reduction of disorders of conduction of efferent impulses of motor fibers, appearing already in the first days after surgery. Increased drainage rate also accelerates the reinnervation process, shortens it by several weeks, and reduces pain symptoms.

Key words:

reinnervation, facial nerve, lymphatic oedema, dental physiotherapy

Streszczenie

Wstęp. Obrzęk chłonny twarzowej części czaszki jest jednym z głównych powikłań, które obserwujemy u pacjenta po przebytym leczeniu chirurgicznym zaburzeń tego obszaru. Kolejnym z zauważalnych i często zgłaszanych przez pacjenta powikłań jest wystąpienie nieprawidłowości w pracy mięśni wyrazowych twarzy. Pytaniem jest, czy oba zaburzenia ze sobą korelują i czy redukcja obrzęku dokonana u pacjentów w pierwszych dobach po zabiegu spowoduje zmniejszenie odnotowywanych zaburzeń funkcji gałązek ruchowych.

Cel. Zbadanie wpływu wczesnej redukcji obrzęku na zakres występujących zaburzeń układu nerwowego i tempo jego reinerwacji.

Materiały i metody: Do badania włączeni zostali pacjenci Kliniki Chirurgii Szczękowo-Twarzowej Uniwersyteckiego Szpitala Klinicznego im. WAM-CSW w Łodzi. Badania przeprowadzono w grupie 60 osób, które poddały się zabiegom z dziedziny chirurgii szczękowo-twarzowej w terminie od lutego do grudnia 2019 roku. W redukcji obrzęku u pacjentów stosowane były drenaż limfatyczny oraz plastrowanie dynamiczne. Procedurom tym poddanych zostało 45 osób podzielonych na trzy równe grupy. 15 pacjentów stanowiło grupę porównawczą. Narzędziami badawczymi były ankieta stworzona zgodnie z autorskim pomysłem, linijne pomiary służące pomiarom obrzęków oraz skala Pietruskiego, służąca ocenie stanu reinerwacji zobrazowanego motoryką mięśni mimicznych. Pacjenci zostali przebadani czterokrotnie, w 1. dobie po zabiegu operacyjnym, następnie w 3. dniu, 7. dniu od zabiegu i końcowo po 4 miesiącach od zabiegu.

Wyniki. Zastosowanie terapii przeciwobrzękowej w sposób zauważalny (od 2 do 5 pkt. w skali Pietruskiego) zmniejsza zaburzenia w funkcji mięśni wyrazowych twarzy już w 3. dobie po zabiegu. W odniesieniu do odczuwalnego przez pacjenta bólu brak opracowania manualnego układu chłonnego skutkował pozostaniem odczuć bólowych w każdym z 3 przeprowadzonych badań. Występujące wielkość obrzęku, poziom bólu i poziom zaburzeń funkcji mięśni wyrazowych twarzy stanowiły podobieństwo między grupami i czyniły następujące dalej badania obiektywnymi pod względem odnotowywanych zależności.

Wnioski. Wyniki występujących zaburzeń w obszarze mobilności mięśni wyrazowych twarzy (na podstawie skali Pietruskiego) wskazują, że wdrożenie terapii przeciwobrzękowej, a tym samym jego redukcja, już w pierwszych dobach po zabiegu zapewnia zmniejszenie występujących zaburzeń przewodzenia impulsów eferentnych włókien ruchowych oraz iż nie ma znaczącej różnicy w wynikach grup z zastosowaną terapią drenażową, ani w pierwszych dobach po, ani przy końcu terapii.

Słowa kluczowe:

reinerwacja, nerw twarzowy, obrzęk limfatyczny, fizjoterapia stomatologiczna

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Introduction

Lymphoedema of the facial skull is one of the significant complications we observe in patients who have undergone surgical treatment of mechanical disorders. As a result of the treatment, protein molecules diffuse into tissue fluids, leading, among others, to reduce the number of proteins in the blood (hypoproteinaemia). This condition contributes to the reduction of the resorptive abilities of the placenta. Besides, the process of lymphatic insufficiency is intensified by increased blood supply, increasing pressure in the capillaries, and the resulting significant increase in small blood vessels' permeability.

It comes to a state of functional failure. Under such conditions, a properly functioning lymphatic system overloads by extremely high fluid load, there is a temporary decrease in transport capacity and a low-protein swelling (Fig. 1).

Fig. 1. Edema of the middle and lower levels of the facial skull in a patient after orthognathic surgery (left). A patient with reduced edema in the middle and lower levels of the facial skull (right)

Another postoperative complication is the occurrence of abnormalities in the activity of facial expression muscles. These irregularities may arise as a result of many mechanisms. The impulse conduction may be disturbed by damaging the nervous system's fibers by trauma, the so-called "From stretching" (Fig. 2). During the procedure, the surgeon tries to move the nerve away from the immediate treatment area, stretches its tissues. Pulling is excessive; more than 5% of a specific nerve's length stretches the tissues and may lead to disturbances in the impulse conduction process. The surgeon's actions may also disrupt the

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Fig. 2. Dynamic taping – lymphatic application on the facial part of the skull

continuity of the tissue structures that make up the nerve branches. In this case, damage to the myelin sheath and the axon (neurotmesis), or the axon itself, may occur with the preservation of nerve continuity (axonotmesis). However, most often, surgical actions lead to a condition called neuropraxia, i.e., usually pressures on the nerve without breaking its continuity or damaging only the sheath, followed by a temporary reduction or interruption of impulse.

Neurapraxia is often associated with and exacerbated by a state of nerve tissue ischemia that may occur due to the nerve being in the hemorrhage area and lymph overload. Both of these phenomena cause disturbances in intra-tissue slides and pressure on all surrounding tissues. Hence, the question arises whether there is a relationship between the above-mentioned postoperative complications and whether the reduction of edema performed in patients in the first days after surgery will reduce the disturbances in locomotives' functions in short- and long-term observation.

Aim

The aim was to investigate the impact of early reduction of edema on the range of disturbances in nervous structures and their reinnervation rate.

The specific objectives were:

- to study the impact of individual methods of improving transport in the lymphatic system on the state of edema in patients who have undergone facial-maxillary surgery,
- the impact of lymphatic drainage and / or application of kinesiotaping patches, applied short-term immediately after surgery, on the length of the patient's neurological convalescence after surgery in the facial part of the skull,
- to study the impact of postoperative edema on the extent of impairment of nerve branch functions in patients undergoing surgical treatment,
- to examine the influence of postoperative edema on the level of subjective pain sensations reported by patients.

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Materials and methods

This study was approved by the Bioethics Committee (number RNN / 408/19 / KE) for human research. Patients of the Maxillofacial Surgery Clinic of the University Clinical Hospital of WAM - CSW in Łódź. Sixty people were enrolled for the study and randomly divided into four groups of 15 people. The primary criterion for inclusion in the study was maxillofacial surgery, including the reconstruction of mechanical disorders of the passive and active apparatus of the skull's facial movement (Fig. 3). The additional criterion was the occurrence of postoperative lymphedema or accompanied by neuronal dysfunction of facial muscles. The following exclusion criteria were established:

- surgery as a result of cancer,
- the presence of concomitant disease of the central nervous system,
- completely interrupted intraoperative continuity of nervous structures (not appropriately treated),
- the presence of lymphatic system disease before the procedure,
- the presence of dermatological changes on the skin of the face and neck
- lack of informed consent from the patient.

A. The most sided element of the ear patch (porion), the corner of the mouth on the same side (cheilon) (the distance between 1 and 3).
B. The most sided element of the ear patch (porion), the top of the chin (gnathion) (the distance between 1 and 4).
C. The most sided element of the ear patch (porion), the side corner of an eye on the same side (ektokonchion) (the distance between 1 and 2).
D. The angle of the jaw (gonion) - the side corner of an eye on the same side (ektokonchion) (the distance between 5 and 2).
E. The angle of the jaw (gonion) – the top of the nasal bone (glabella) (the distance between 5 and 6).

Fig. 3. Description of the individual measurements used to assess the swelling of the facial skull

After the treatment, all patients received pharmacotherapy - Aescin, Neurovit and Nimesil, and cold compresses up to 4 days after the treatment. Lymphatic drainage and dynamic taping were used to reduce edema.
In the first group, only lymphatic drainage was used. It was performed with the methodology of techniques proposed in the book by Zborowski A. [1]. The drainage was uniform for all patients; three times, on the first, third, and seventh day after the procedure. It was performed for 30 minutes without the use of coupling substances. The second group of 15 people had only Kinesio Taping patches. They used a drainage application (Fig. 4)

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according to the methodology presented in the textbook by Śliwiński Z. and Krajczy M. [2]. K-Active patches by Nitto were provided. The application was applied to degreased skin on the 1st post-treatment day. In the third group, both of the methods mentioned above of reducing swelling were used. Forty-five people, including 28 women and 17 men, aged 17 to 74, with an average age of 36, underwent the procedures related to reducing edema.
Fifteen patients constituted the comparative group; eight women and seven men aged 17 to 63 years, average 30 years.

Type of treatment Liczebność	Abundance	Mean	Median	Standard deviation
Without physiotherapy treatment	15	0.93	0.9	0.58
Lymphatic drainage	15	0.72	0.6	0.46
Kinesio taping	15	0.68	0.8	0.37
Combined lymphatic drainage and kinesio taping therapy	15	0.74	0.7	0.43
Razem/Total	60	0.77	0.75	0.47

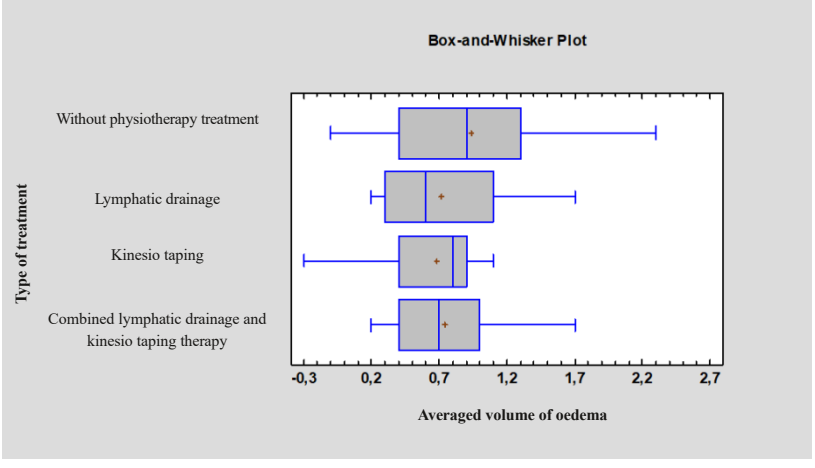

Fig. 4. Summary statistics of the feature – average edema in the area of the facial skull that occurred in patients as a result of a treatment in the field of maxillofacial surgery

These people had only pharmacotherapy and cold therapy treatments. The research tool was an independent survey of the researcher; it contained ten questions about the patient's subjective feelings describing his condition. It was conducted on the 1st day after surgery. The research procedures were linear measurements of facial edema, subjective pain assessment according to the VAS scale and the assessment of the state of branch reinnervation, visualized by the motor activity of mimic muscles according to the Pietruski scale. The facial swelling's linear measurements consisted of 5 measurements, which visualized the swelling of the middle and lower levels of the facial skull (Fig. 5). Measurement procedures were performed four times, on the first day after the surgery, then on the third and seventh day, and finally four months after the surgical intervention. The measurements were taken at the beginning of the visits; the only exception was the VAS scale completed by the patients at the therapeutic follow-up visit.

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Type of treatment	Abundance	Mean	Median	Standard deviation
Without physiotherapy treatment	15	1.73	2.0	1.44
Lymphatic drainage	15	0.2	0	0.56
Kinesiotaping	15	0.4	0	0.74
Combined lymphatic drainage and kinesio taping therapy	15	0.2	0	0.77
Razem/Total	60	0.63	0	1.22

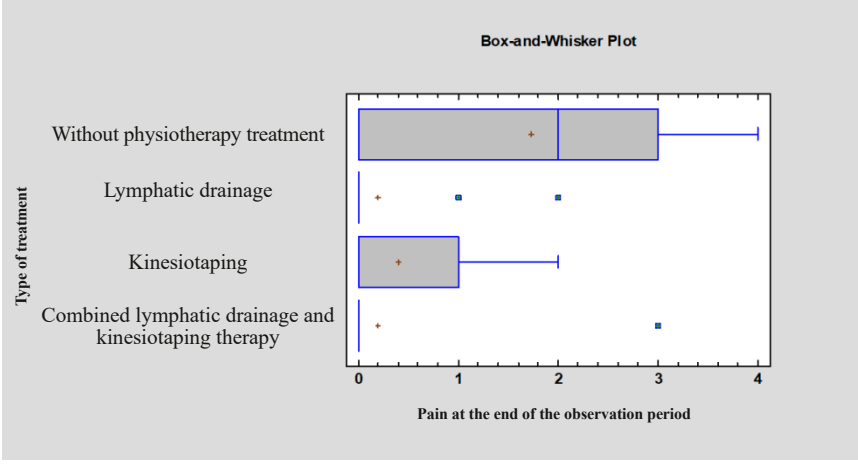

Fig. 5. Summary statistics of the feature – the average subjective level of pain (after 4 months) in the area of the facial skull that occurred in patients as a result of performing a treatment in the field of maxillofacial surgery

The collected data were statistically analyzed in the Statgraphics Centurion 18 program. One-way ANOVA analysis of variance was used to perform the statistical analysis. When there was a statistically significant difference in the variance value between the compared groups during statistical processing, the Kruskall-Walis test was used. Comparing the results was used to investigate whether there are statistically significant differences between the groups created in this experimental and research work; if the ANOVA or Kruskall-Wallis test variance result was: $p < 0.05$, it was assumed that there are statistically significant differences between the groups analyzed in terms of the examined factor.

Results.

When analyzing the level of damage that occurs in the motor branches of the facial nerve due to surgery, it can be seen that the occurrence of edema correlates with the level of neuronal disorders. On the first day after the surgery, the mean score on the Pietruski scale for all patients participating in the studies oscillated around 20 points. (+/- 4). There was no statistically significant difference between the groups, which made them comparable to further studies in terms of this feature. In the measurement data from the third day, we see an increase in the test groups (+/- 2 points on the Pietruski scale) in the scores corresponding to the facial muscles' capacity. In the comparative group, after the same period, we noted a decrease in this parameter by a point. There is a statistically significant difference between the study groups and the control group (P-

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Value = 0.00013). One week after the surgery, we note a similar increase in twigs reinnervation in all groups, adequately moving to improve facial expression muscles.
The average result on the Pietruski scale fluctuates around 24 points (+/− 7). There is a statistically significant difference between the study groups and the control group (P-value = 0.000015). The results recorded after 4 months after the procedure indicated in the study groups the return of the facial muscles' examined functions in the range of 92–96% of the full norm. On Pietruski's scale, this result is 27 points. (+/− 2 points) (Fig. 6). After the same period, patients from the control group achieved an average level of 23 points. (+/− 3 points). There is still a statistically significant difference between the study groups and the control group (P-value = 0.000027).

Type of treatment	Abundance	Mean	Median	Standard deviation
Without physiotherapy treatment	15	23.07	23.0	3.97
Lymphatic drainage	15	29	30.0	1.93
Kinesiotaping	15	28.6	30.0	2.16
Combined lymphatic drainage and kinesiotaping therapy	15	27.6	30.0	3.48
Razem/Total	60	27.07	29.0	3.78

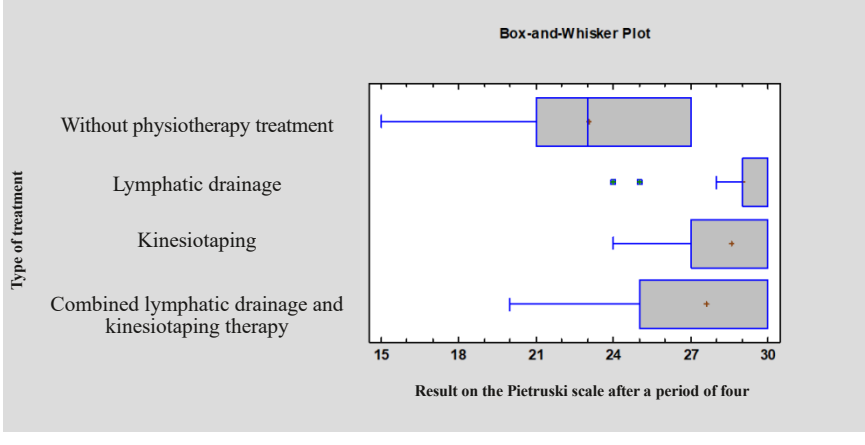

Fig. 6. Summary statistics of the feature – the average level of facial nerve motor twigs reinnervation (after 4 months) that occurred in patients as a result of a maxillo-facial surgery procedure

After four months, patients' subjective assessment based on the conducted questionnaire showed that the anti-edema therapy introduced in the first days after the procedure resulted in reduced disturbances in sensory branches. After the end of the observation period, none of the respondents, out of the three study groups, reported any perceptible/noticeable neurological disorders. On the same question, only 20% of patients in the comparative group indicated complete regeneration of the nervous system after the period mentioned above, and thus no abnormalities in the conductivity of sensory stimuli in the facial skull area.

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Such factors did not influence the described state of peripheral nervous system reinnervation presented above as gender, place of residence of the person participating in the study, or their education.

Similarities between the groups were noted when analyzing data about pain levels in four postoperative periods. This level in all groups decreased as a function of time to a similar degree. However, it should be pointed out that in the groups with manual lymphatic drainage, from the first day until the end of the therapy, the level of pain sensations was significantly lower than in the patients of other groups. The differences in the reported intensity of nociceptive sensations between the manual drainage groups and the control group were statistically significant from baseline (P-Value = 0.000008) to four months after (P-Value = 0.0004). After the end of therapy, the reported average pain level exceeded 1 point only in the comparative group on the VAS scale and oscillated at the level of 2 points (the median level) (fig. 7).

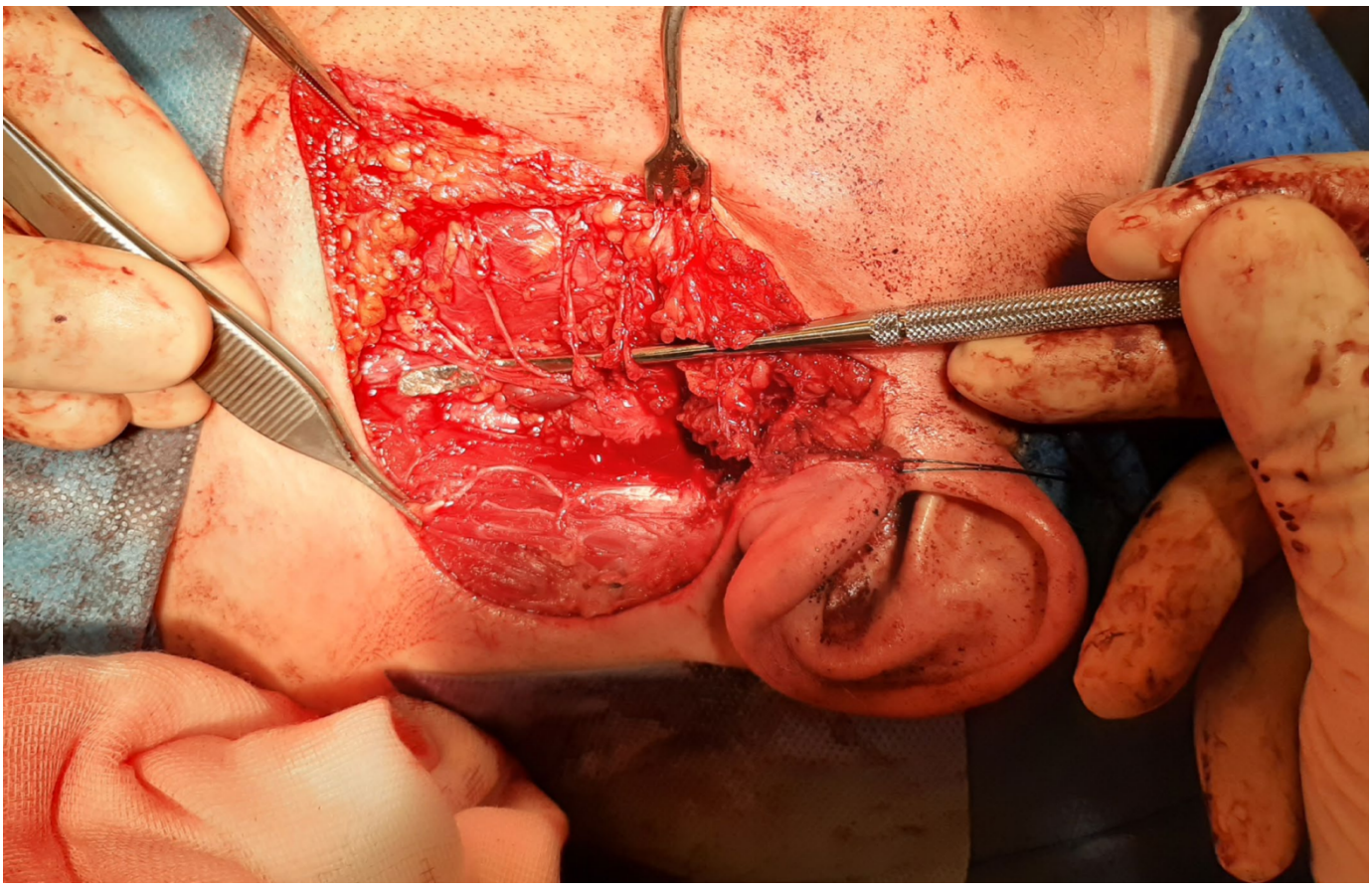

Fig. 7. The dissected facial nerve – intraoperative picture during the resection of the multiform adenoma of the left parotid gland

Also, the data relating to the reduction of edema show many similarities between the groups. The applied drainage methods

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contributed to a similar degree of edema reduction. During the first days after the procedure and the measurements made on day 7, no significant differences were found due to the influence of the drainage techniques used on the lymph transport effect. The most remarkable effectiveness was achieved with a comprehensive approach to therapy, combining the effect of increasing the cross-section of lymphatic vessels with the direction of the mechanical shift of excess lymphoid tissue. The average size of the swelling in the middle and lower parts of the face fluctuates around 0.8 cm (+/- 1.3 mm) (Fig. 8). It is the difference between the measurements taken on the 1st day and four months after the procedure and averaged for all five measurements. The standard deviation level for this data is 0.8 cm (+/- 6 mm). The fewest differences in this measurement are presented by patients in the group receiving comprehensive anti-edema therapy (consisting of both drainage techniques). On the other hand, the most numerous results were observed in the comparative group and the studied groups among patients with the glued application of Kinesio Taping tapes as an independent technique.

Fig. 8 Intraoperative picture – anastomosis of the condylar process with the use of specially dedicated fusing plates (Medical Univeristy of Łódź patent)

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Discussion

A significant number of specialists, including Tozzi U, Santagata M, Ristow O, Pautke C. [3, 4, 5], attempt his research to find an effective method of preventing and dealing with the complications of treatments in the facial part of the skull. Among these disorders, most often and most of all, there are such abnormalities as obstructed circulation in the lymphatic system, leading to the formation of edema, disturbances in nerve impulse conduction, and impaired joint mobility. Another complication, or rather a symptom of other abnormalities, was a subjective pain sensation in patients.

The nature and etiology of complications occurring after orthognathic or dental surgery procedures are the same as those which can be observed during other surgical procedures on the human body. Hence, in combating complications in the facial cranium area, research has begun using treatments, which are already analyzed in large numbers in the treatment of disorders, including in the limb area (Windisch C, Brodt S) [6]. The treatments used in the studies as mentioned above to minimize postoperative complications include, among others: Kinesio Taping and cold therapy treatments (Ulu M, Gözlüklü Ö, Donec V, Kriščiūnas A, Nunes GS, Vargas VZ, Gülenç B, Yalçin S) [7–10].

Danuta Lietz-Kijak et al. report that dynamic taping usage enables the reduction of tissue tension and facilitates the return of proper circulation of fluids – blood and lymph. Such effects ensure a faster than natural conditions reduction of excess lymph from the facial skull area and enable physiological micro and macro blood supply, and consequently tissue nourishment [11].

Ristow O. et al. reports similar observations as the conclusions mentioned above. In this report, the impact of taping on the recovery of homeostasis in the lymphatic circulation and the locomotor system represented by the temporomandibular joints was analyzed, and reduced subjective pain sensations. The authors report that the Kinesio Taping therapy implemented in the early days after the surgery allowed for a faster reduction of edema than in the comparative group without the application. The reduction of excess lymph after two days was already at the level of 60% of its total volume. Among the achieved results, scientists also mention less pain and less significant disturbances in mandible mobility [12].

Another group of scientists, with Tozzi U. describe effects identical to those presented in the above-mentioned scientific reports. The previous authors also report that dynamic taping therapy improves the postoperative quality of life in orthognathic patients. In all these studies, the achieved results are characterized by statistical significance, assumed at the level of $p < 0.05$. They also emphasize that the therapy is cheap, widely available, and with a broad spectrum of usefulness [3].

Similar results and conclusions obtained in patients with injuries in the stomatognathic system and adjacent / functionally cooperating areas, but different than the complications of orthognathic procedures, are presented in the works of numerous authors, including da Rocha Heras ACT et al., González-Iglesias J et al. and Ristow O et al. [13–15] The first team of scientists writes about the use of dynamic taping therapy in patients after removal of third molars. In the article on

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reducing disorders after a whiplash injury, presented by González-Iglesias J., the usefulness of the tapes in reducing disorders and improving the elements of the active musculoskeletal system is also documented. Moreover, a team of scientists, led by Ristow O., one work of which was cited above, also successfully performed plaster therapy in patients with orbital zygomatic fractures and after surgical adjustment and osteosynthesis of mandibular fractures.

Alternative therapy methods of the considered disorders are laser therapy, manual lymphatic drainage, or the aforementioned cold therapy.

Glass GE et al. Presented the topic of low-temperature therapy in a review, summarizing 61 scientific reports. This paper shows that cold therapy also reduces pain, reduces swelling, and contributes to an increase in postoperative quality of life. On the other hand, unlike therapy with Kinesio Taping, the effects are short, and the recurrence of complications occurs when the therapy is finished [16].

Exploring the effectiveness of laser therapy, the topic which was discussed, a team led by Gasperini G, points out that, in the first days after the procedure, it did not bring any improvement in the reduction of edema, while in the analysis of the results from the 3rd, 7th, 15th and 30th day there was statistically significant drainage. Following further comparisons of the results, we can observe that for the treated side and the side in which regeneration occurred spontaneously, a reduction in the level of subjectively perceived nociceptive symptoms occurred in the first days. These results make laser therapy a method comparable to dynamic taping. With the difference in dynamic taping therapy, the result in lymph reduction occurs in the first days after the procedure, which significantly reduces the patient's discomfort due to surgical treatment at this stage [17].

The research team with the principal investigator Yaedú RYF aimed to verify the influence of lymphatic drainage on the formation and removal of edema and the influence of this technique on the level of perceived pain in patients after orthognathic surgery. The project consists of two groups of patients, those undergoing manual drainage combined with cold therapy and pharmacotherapy, and a placebo group in which only superficial stroking movements were performed instead of drainage techniques. Besides, patients were asked to subjectively assess the perceived pain and the size of their swelling. As a result of the observations, the authors conducting the project noted that manual drainage did not affect the occurrence of a difference in perceived pain and the perception of lymph accumulation level [18]. Moreover, in linear measurements, the patients' opinion about the lack of drainage efficiency on the level of edema increase was confirmed.

On the other hand, the results describing the pace of lymph excess reduction show the statistical significance and indicate an evident increase in lymph transport to venous angles in patients undergoing lymphatic massage techniques. The mentioned results indicate the Kineso Taping application's superiority over the therapy using manual lymphatic drainage and confirm that cold therapy treatments are an insufficient stimulus to obtain lasting effects.

A separate topic that should not be missed is the method of measuring the existing swelling. Most authors, including those

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of the presented work, in their reports, refer to a five- or six-dimensional, linear, manual method of registering the dimensions of the face. These dimensions link the mandible angle and / or the section of the ear to the eye corner, mouth angle, mental tuberosity, and / or the wing of the nose. However, there are works whose authors indicate the imprecision or difficulty in carrying out the model mentioned above of recording the intra-tissue absorbent load volume in the literature. These include teams led by Rana M and Yamamoto S [19, 20].

In the scientific report of the first team, in studies on the resolution of postoperative disorders after orthognathic surgery, three-dimensional optical scanning of the facial skull was used to assess the volume results. The ease of imaging and handling and the high precision of the measurements made during the research led the researchers to conclude that this method of measuring is adequate, simpler, and less burdened with inaccuracies than the manual method. Yamamoto's team also used three-dimensional tomographic imaging enriched with laser face scanning to quantify the volume of lymph in the soft tissues affected by postoperative disruptions following BBSO. As in the syndrome affirmed by Ran M., also with these authors, there is a conviction that the solution to the difficulties with determining and uniformly marking topographic points within the face is to take measurements not directly on the patient but a three-dimensional slide/model showing his tissues. As mentioned above, the studies were conducted on groups of several dozen people and did not have control groups. Hence the results are exciting and worth in-depth analysis, but it is necessary to create new projects and further research. It is necessary to simultaneously record and compile the results, an alternative manual measurement method, and the computer method.

To conclude the discussion, a link to the articles of the research teams, which seem to analyze the subject of postoperative complications in the facial skull area in the most multidimensional way, resulting from the corrective osteotomy of one or both bones forming the dental arches. The aspects analyzed in them, the issues of the impact of surgery on the human system, correspond to the presented work results.

Researchers, led by Ran M., followed apart from the elemental correlations between edema, pain and the level of quality of life, and the impact of the procedure on the facial part of the skull's innervation. This team uses two types of tissue cooling as a procedure to reduce swelling [19]. According to the authors, differences between groups, especially in terms of edema, are statistically significant after treatment. One might expect that complications in some way would be various for these comparable groups. The authors, however, state that the level of neuronal disorders is at a similar level. Has the pressure of tissues on the nerve branches decreased, and there has been no significant reinnervation difference? There can be two reasons for this state of affairs, assuming that the monograph results are well interpreted. As a result of surgery, there was a significant injury in nerve continuity or a stimulus such as cold, reduced edema, and adversely affected the network of nerve connections and aggravated nerve impulse conduction disturbances. Hence, one should take a look at other reports.... Researchers of Semper-Hogg [21], also attempted to analyze the relationship

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between the edema arising after surgery and the level of nerve conduction. In this article's study, researchers attempted to reduce swelling with a postoperative injection of dexamethasone and cold therapy. As a result of the analyses, they found that the injections positively affected the swelling reduction pace, but the administered active substance did not affect the reinnervation process.

The results correlate with those presented by the team led by Ran M. Again, the anti-oedematous therapy proves to be effective, but the reduction of fluid load and thus intra-tissue pressure does not affect the reinnervation process. However, there is still a coexisting therapy – cold therapy. Referring to these results to the results presented in the monograph above and the research described by the teams led by Al-Bishri or Seo, it should be assumed that two aspects were responsible for the lack of positive effects in the nervous system. The chill slowed down the reinvention pace, and the methods to stimulate the process were too modest. When higher doses were administered, such as with Al-Brishri, or when injections were carried out over a more extended period, what Soe used or another method of stimulating reinnervation was used, the results improved. The research must be continued. Postoperative disorders are also worth correlating with the surgical method's variable and the trans-tissue access selected for its implementation [22, 23]. As we learn from the preliminary reports of Semper-Hogg, there are differences in complications between the various techniques of procedures. Moreover, an adequate and comprehensive therapy model should be developed to increase comfort for patients [21].

Observing the more frequently reported monographs covering the topics discussed in the above report, one can also get the impression that the issue can be analyzed in depth. However, as the team led by J O Agbaje notes in their review article, most of the work does not include a return to homeostasis after all emerging postoperative complications. In the collected articles, more than half of the authors note meticulously appearing complications. However, observations of reinnervation, whether stimulated or spontaneous, are mentioned in the summary and conclusions only by the authors of a few works in this article, for the process of reinnervation, these are just three items [24].

Conclusions

1. The results of the disturbances in the area of facial expression muscles mobility (based on the Pietruski Scale) indicate that the implementation of

anti-oedematous therapy, and thus reduction of the absorbent load. In the first days after the procedure, reduce the existing disorders

conduction of impulses of efferent motor fibers (there is statistical significance).

However, there is no significant difference between the group scores

with various drainage, therapies applied, neither in the first days after or at the end of the therapy.

2. The introduction of lymphatic drainage therapy in the first days after the procedure accelerates the reinnervation process and shortens it several weeks. This relationship applies to both sensory and motor branches.

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3. Anti-edema therapy using manual techniques concerning the subjective reduction of reported pain sensations shows better effectiveness than dynamic taping therapy. The differences between the level of nociceptive sensations between the group with the application of Kinesio Taping tapes and the control group show that the reduction of edema also positively influences the pain level's reduction. We notice the above dependence regardless of the stage of therapy at which we analyze the subject of subjective pain sensations.
4. The anti-edema therapies seem to be an effective method of swelling reduction, regardless of the technique used to support lymph transport. The most effective is a comprehensive approach to therapy, combining the effect of increasing the cross-section of lymphatic vessels and a targeted mechanical shift of excess lymphoid tissue.

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