Nutritional Status of Hospitalized Nonsurgery Patients at a Nationwide Referral Hospital in Indonesia

*Ina Farhaniah[1], Adiningsih Srilestari [1], Kemas Abdurrohim[1], Abdul Latif [2]**

1. Department of Medical Acupuncture, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia
2. Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia.

Abstract

Surgical extraction of impacted third (odontectomy) may cause complications such as pain, swelling and trismus. Thereby affecting the quality of life of patients. Acupuncture has proven beneficial for the management of dental pain postsurgery in patients with impacted third molars. The purpose of this study was to determine the effects of electroacupuncture and medications after surgical extraction of impacted third molar. A total of 44 patients undergoing impacted mandibular third molar extraction were randomly divided into two groups (n = 22 each) based on the type of treatment: experimental (electroacupuncture and medications) and control (sham electroacupuncture and medications). The experimental group received low intensity stimulations on points ST6 and ST7 on the side to be operated, and LI4 and LR3 bilaterally, for 20 minutes at a frequency of 3/15 Hz. In the control group, electroacupuncture was performed by placing the needles on the tape at the same points without penetrating the skin or turning the electrostimulator. Mefenamic acid (3 x 500 mg) and amoxicillin (3 x 500 mg) were provided to the patient after surgery. The pain-free time interval was assessed shortly after surgery. Assessment of visual analog scale (VAS) score was performed on days 1, 3, and 7 postsurgery while an interincisal-distance assessment was performed on days 3 and 7 post-surgery. Significant differences in the pain-free time interval, VAS score, and interincisal-distance were noted in the treatment group when compared with the control group ($p < 0.05$).

Clinical article (J Int Dent Med Res 2019; 12(4):1409-1415)

Keywords: odontectomy, electroacupuncture, pain-free time, visual analog scale (VAS), interincisal-distance.

Received date: 11 November 2018 **Accept date:** 24 February 2019

Introduction

Impacted mandibular third molars are a common occurrence in routine dental practice. Impacted permanent tooth is a pathological condition, where the tooth does not erupt into the oral cavity in its normal position. Impactions arise due to a mismatch between the size and shape of the tooth and the jaw. The third molars erupt in patients during the late teens or early twenties; the incidence of complications during and after the extraction of these teeth ranges from 26% to 30.9% and is influenced directly by the depth of impaction and age of the patient. The complications of odontectomy in patients with impacted third molars with regard to the quality of life were reported to increase by threefold when compared to those in asymptomatic patients. Based on data obtained from the Dental and Oral Special Hospital at the Fakultas Kedokteran Gigi, Universitas Indonesia (FKGUI) in Jakarta, 1,441 patients required surgical removal of impacted third molars at the Oral Surgery Polyclinic between 2015 and 2017.[1,2]

Postoperative pain and swelling can be treated by analgesia before and after surgery to reduce the inflammatory response. Nonsteroidal anti-inflammatory drugs (NSAIDs) are analgesics that inhibit the action of cyclooxygenase enxymes which play a role in the onset of inflammation. However, these drugs can cause various adverse effects, such as ulceration in the digestive tract and increase in the risk of bleeding during surgery.[3,4,5]

Corresponding author:
Abdul Latif
Department of Oral and Maxillofacial Surgery,
Faculty of Medicine Universitas Indonesia
Jakarta, 10430, Indonesia
E-mail: boblatif06@yahoo.com

Pain and trismus that occur in patients after surgical removal of an impacted third molar can interfere with the process of chewing or opening the mouth. Medications such as NSAIDs can help alleviate symptoms, but side effects such as nausea, gastric irritation, and ulceration and the expected results have not produced satisfactory results. Previous studies have shown positive effects of the use of acupuncture as an adjunct therapy patient with impacted molars. The systematic review conducted by Rosted (1998) on the benefits of acupuncture in dentistry concluded that acupuncture was effective for analgesia after tooth extraction and for the treatment of TMJ dysfunction and facial pain.[6]

Tavares et al (2007) conducted a study to assess the effectiveness of electroacupuncture on postoperative pain after mandibular third-molar surgery. They reported that acupuncture significantly reduced the postoperative visual analog scale (VAS; $p < 0.05$) and reduced analgesic consumption ($p < 0.05$).[7] Kassis (2016) demonstrated that acupuncture can reduce the intensity of postextraction pain in the case of impacted third molars.[8]

The aim of the present study was to determine the effect of electroacupuncture and medical therapy on pain-free time intervals, pain intensity (VAS), and the interincisal-distance following the surgical removal of impacted mandibular third molars.

Malnutrition has a great impact on morbidity, mortality, and quality of life. Malnourished patients experience longer hospitalization and higher cost.[3,8] Hence, it is important to identify risk factors for early identification of malnutrition. In patients with medium or high-risk malnutrition, nutritional interventions, such as oral nutritional supplementation, are associated with reduced hospital stay and bed-day and complication costs compared with those of patients who receive no oral nutritional supplementation.[9]

Few reports on hospital malnutrition in adults exist in Indonesia. One study in children reported a 1.8% prevalence of severe malnutrition.[10] This study determined the prevalence of hospital malnutrition in adult nonsurgery patients at Dr. Cipto Mangunkusumo National General Hospital, Jakarta, Indonesia.

Methods

This study was conducted at the Oral Surgery clinic, RSKGM-FKGUI, Jakarta from December 2017 to January 2018. A total of 44 patients scheduled to undergo surgical removal of an impacted mandibular third molar by resident doctors were included in this single-blinded, randomized clinical trial.

The inclusion criteria were males or females patients aged 18–40 years with impacted mandibular third molars who were willing to participate in the study. Exclusion criteria were pregnant women, those who had consumed analgesics one day prior to the study, and those who presented with contraindications to acupuncture and electroacupuncture, such as the use of pacemakers, medical emergencies, injuries or infections at the acupuncture treatment locations, blood-clotting disorders, anticoagulant consumption, and metal implants. The patients were randomly divided into two groups as follows: treatment (electroacupuncture and medication) and controls (sham electroacupuncture and medication) using computer-based random-number tables. The effects of the treatments on pain-free time intervals, VAS, and interincisal-distance were assessed in the patients.

The treatment group received acupuncture treatments using needles (0.25 mm × 25 mm) at points ST7 and ST6 on the side to be operated and LI4 and LR3 bilaterally. They were connected to an electrostimulator with a dense disperse wave at a frequency of 3/15 Hz for 20 minutes. The control group received sham electroacupuncture, which involved the action of attaching the tape to the ST7 and ST6 points on the side to be operated and LI4 and LR3, bilaterally. Acupuncture was performed on the tape using an acupuncture needle without penetrating the skin. This was followed by the attachment of the electrode to the needle without turning the electrostimulator on. The acupuncture treatment was carried out once over a period of one week. The medications given to patients after surgery were mefenamic acid (3 × 500 mg) and amoxicillin (3 × 500 mg) for 5 days. Assessment of pain-free time was carried out after surgery until the onset of pain due to the loss of local anesthetic effect. VAS

assessment was carried out on days 1, 3, and 7 postsurgery, while assessment of interincisal-distance was conducted on days 3 and 7 after surgery.[9,10]

Data analysis was performed using the computer software tool SPSS version 21 for Windows (SPSS Inc. USA). Comparative hypothesis testing of numerical variables with normal distribution in two paired groups (for intragroup analysis) used paired T tests; if the data distribution was not normal, then the Wilcoxon test was used. Comparative hypothesis testing of numerical variables with normal distribution in two unpaired groups (for analysis between groups) used the unpaired T–test; if the data distribution was not normal, then the Mann–Whitney test was used. The significance limit used was 0.05 with a 95% confidence interval.

Results

In Table 1, there is no significant difference on the age, education, sex, and surgery duratio variable between the two groups, based on the characteristics of the subjects.

The result in table 2 showed significant differences in pain-free time interval in the treatment group compared to the control group (p <0.001). The Mann-Whitney test shows that there is a statistically significant difference on the pain-free time variable between the two groups (p <0.001). The result of this research indicates pain-free time that extends in the treatment group.

The median interval after surgery is obtained until the pain arises or the median pain free time is 40.00 (20–120) minutes in the control group. In the treatment group, a median interval of 105.00 (20–1,080) minutes showed a longer analgesic effect where the time interval between tooth extraction and the appearance of pain was longer than in the control group (p <0.001).

There was significant difference of VAS score in the treatment group compared to the control group (p <0.05) and significant difference of interincisal distance score in the treatment group compared to the control group (p <0.001). The median (minmax) VAS score on day 1 was 7 (2–9) in the control group and 3 (2–8) in the treatment group, indicating a significantly (p < 0.001) lower intensity of pain in the treatment group. The median (min-max) VAS score was 2 (0–6) in the control group and 0 (0–5) in the treatment group on day 3, and 0 (0–2) in the control group and 0 (0–1) in the treatment group on day 7 (p < 0.05). Significant differences in VAS score were noted on days 1, 3, and 7 (p < 0.05) between the two groups due to the analgesic effects of acupuncture (Table 3 and figure 1).

Characteristics	Electroacupunture and medications group (n = 22)	Sham electroacupunture and medications group (n = 22)	P
Age (years)			0.67*
Mean (SD)	26.27 ± 6.041	27.14 ± 7.153	
Education, n (%)			0.34**
High school	10 (45.5)	7 (31.8)	
Undergraduate	11 (50.0)	15 (68.2)	
Graduate	1 (4.5)	0 (0.0)	
Sex, n (%)			0.19**
Male	9 (40.9)	5 (22.7)	
Female	13 (59.1)	17 (77.3)	
Surgery Duratio (%)			1.00**
20 – 40 minutes	19 (86.4)	20 (90.9)	
41 – 60 minutes	3 (13.6)	2 (9.1)	

Table 1. Characteristics of Subjects. SD = standard deviation; *Independent Sample T-test. **Chi square test

Variable	Electroacupunture and medications group (n = 22)	Sham electroacupunture and medications group (n = 22)	P
Pain–free time (min) Median (Min-Max)	105.00 (20 – 1,080)	40.00 (20 - 120)	< 0.001*

Table 2. Comparison of pain-free time interval after the surgery between the experimental and control groups.

Variable	Electroacupunture and medicamentosa group (n = 22)	Sham electroacupunture and medicamentosa group (n = 22)	P*
VAS-1	3.00 (2 – 8)	7.00 (2– 9)	< 0.001
VAS-3	0.00 (0 – 5)	2.00 (0 – 6)	< 0.001
VAS-7	0.00 (0 – 1)	0.00 (0 – 2)	0.028

Table 3. Comparison of Visual Analog Scale (VAS) Score between electroacupunture & medications group and sham electroacupunture & medications group. *Mann–Whitney Test

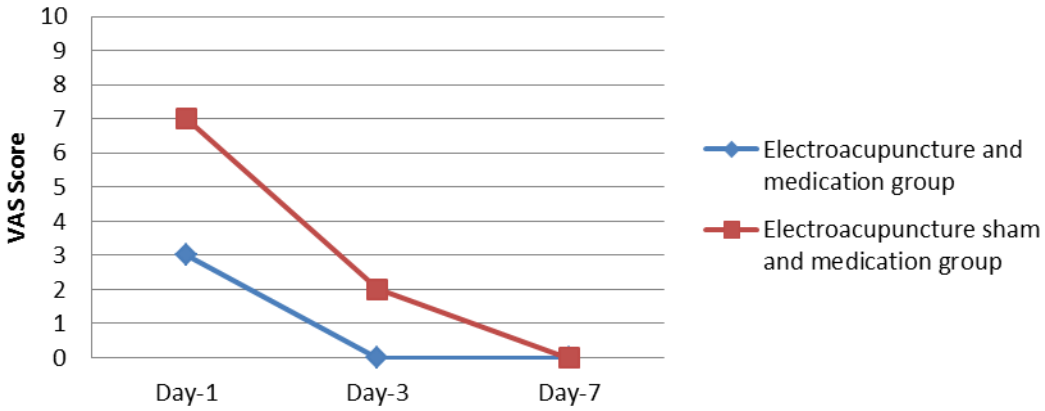

Figure 1. Graph showing the visual analog scale (VAS) score on days 1, 3, and 7 after surgery.

Variable	Electroacupunture and medications group (n = 22)	Sham electroacupunture and medications group (n = 22)	P
Interincisal distance Day 3 (mm) Median (Min-Max)	32.00 (28 – 45)	25.00 (20 – 33)	< 0.001*
Interincisal distance Day 7 (mm) Rerata (SD)	41.32 ± 3.682	33.64 ± 3.799	< 0.001**

Table 4. Comparison of interincisal distance score between the experimental and control groups.

SD = standard deviation *Mann Whitney Test. ** Independent sample T-test.

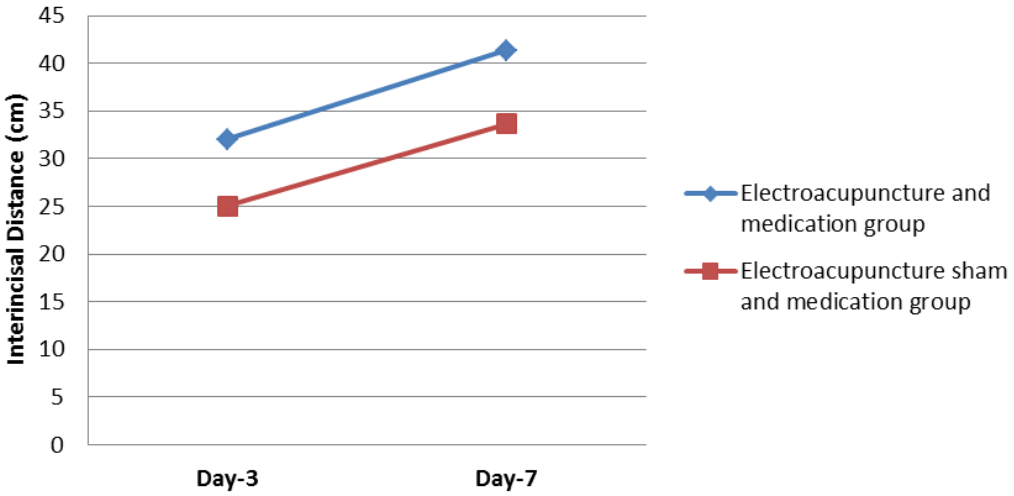

Figure 2. Graph showing interincisal distance on days 3 and 7 after surgery.

Significant differences in interincisal distance scores on days 3 and 7 were observed between the treatment and control groups (p < 0,001). The degree of trismus on day 3 was 25 (20–33) mm in the control group and 32 (28–45) mm in the treatment group (p < 0.001). On day 7, the mean ± standard deviation values in the control were 33.64 ± 3.799 mm and in the treatment group were 41.32 ± 3.682 mm, respectively (p < 0.001). Thus, significant differences were noted between the treatment and control groups.

The VAS score on day 1 was 7.00 (2–9) for the control group and 3.00 (2–8) for the treatment group (p < 0.001), indicating lower pain intensity in the treatment group. On day 3, the VAS score was 2.00 (0 – 6) for the control group and 0.00 (0–5) for the treatment group (p < 0.001), indicating lower pain intensity in the treatment group. On the day 7, the VAS score was 0.00 (0-2) for the control group and 0.00 (0-1) for the treatment group (p = 0.028), indicating lower pain intensity in the treatment group. The VAS scores on days 1, 3, and 7 are different and statistically significant (p<0.05) between the two groups due to the appearance of analgesic effects of acupuncture.

In the table 4 shows that there is a significant difference of interincisal-distance score on day 3 and day 7 between the electroacupunture & medications group and the sham electroacupunture & medications group (p < 0.001). The assessment of the degree of trismus by measuring the interval distance on the day 3 was 25.00 (20–33) mm for the control group and 32.00 (28–45) mm for the treatment group (p <0.001), indicating mild trismus degree. On day 7, there were 33.64 ± 3.799 mm values in the control group and 41.32 ± 3.682 mm in the treatment group (P <0.001). The assessment results showed significant differences between the treatment group and the control group, where there was an anti-inflammatory, local vasodilation reaction that inhibited edema due to increased vascular permeability and muscle spasm (figure 2).

Discussion

This is the first study to report the use of electroacupuncture for the assessment of pain-free time, VAS score, and interincisal-distance after surgical removal of an impacted mandibular third molar in Indonesia.

The use of electroacupuncture to reduce pain after odontectomy by Kitade et al.[11] Two methods of electroacupuncture were used in their study: in one method, the acupuncture was provided at a frequency of 3 Hz 15 minutes before and after surgery, while in the second method, the acupuncture was performed after 30 minutes of the surgery. The needles were placed on points LI4, ST7 and ST6 on the side of pain until the sensation were felt by the patients; subsequently, the needles were connected to an electrostimulator at a frequency of 3 Hz.[11] No significant differences in VAS scores were noted between the experimental and control

groups in their study. However, the pain-free interval was longer in the experimental group when compared with the control group ($p < 0.05$). Moreover, the performance of acupuncture prior to injection of the local anesthetic proved more effective than that after surgery; acupuncture combined with local anesthesia significantly reduced postoperative pain.[11]

The ST6 and ST7 acupuncture points were selected based on evidence-based medicine to increase the pain threshold and provide analgesic effects locally in the lower-jaw area. The LI4 and LR3 acupuncture points were selected to provide central stimulation to the limbic system and hypothalamus; and stimulate the pituitary gland to release ACTH, beta endorphins, serotonin, and acetylcholine into the blood and cerebrospinal fluid. The LR3 and LI4 points activate the somatosensory cortex, limbic system, basal ganglia, and cerebellum which are involved in pain process.[2,9,11]

The study by Wu et al proved that acupuncture at point LI4 increases the pain threshold in the mandibular area. Furthermore, a neuromagnetic study by Yang et al confirmed that several areas of the brain were stimulated by acupuncture at point LI4. These findings indicate that stimulation of LI4 can inhibit maxillofacial pain. Cerebral functional magnetic resonance imaging (fMRI) examination has demonstrated that the stimulation of point LI4 activates areas of the bilateral hippocampal brain, parahipocampal gyrus, amygdala area, rostral and caudal gynus, prefrontal lobe, occipital lobe, and infratemporal gyrus. Acupuncture on point LI4 increases the pain threshold/ current perception threshold of the mandibular area. Moreover, acupuncture in the facial region has been shown to stimulate the expression of c-fos in the nucleus tractus solitarius.[2]

The study by Tavares et al assessed the effectiveness of electroacupuncture on postoperative pain after odontectomy and found that acupuncture significantly reduced the postoperative VAS score ($p < 0.05$) and analgesic consumption ($p < 0.05$) in patients.[6]

In the present study, we used VAS assessment to determine the effects of acupuncture by taking measurements on days 1, 3, and 7 postsurgery. The measurement on day one was intended to assess the immediate effect of acupuncture on pain treshold and inflammation. In a recent systematic review conducted by Xiang et al. (2017), real acupuncture was reported to be associated with a greater reduction in pain immediately after surgery when compared with sham acupuncture and analgesic injections.[13]

Furthermore, the pain-free time interval was significantly extended in the treatment group when compared with the control group in the current study ($p < 0.05$). The VAS scores on days 1, 3, and 7 in the treatment group were significantly lower than in the control group ($p < 0.05$) due to the analgesic effects of acupuncture, which may have caused muscle relaxation and local vasodilation, thereby reducing local inflammation and pain.

Significant differences in interincisal-distance were observed between the treatment group and the control group ($p < 0.05$). This may be due to the occurrence of an anti-inflammatory, local vasodilation reaction that could inhibit edema following the increase in vascular permeability and muscle spasms. Trismus postodontectomy arises from edema/swelling due to inflammation, resulting in the accumulation of excessive amounts of fluid in the interstitial space. Decreased lymphatic flow may lead to an increase in hydrostatic pressure in the surrounding tissues, altering muscle activity and causing muscle spasms.

The anti-inflammatory effects of acupuncture can be exerted through various routes, such as the modulation of neuropeptides, cytokines, and neurotrophins associated with inflammation, activation of TRPV1 and NF-κ B, and mediation of acupuncture β-endorphins that balance the Th1 and Th2 ratios to suppress proinflammatory cytokines mediated by MAPK p38.[14-16]

In the case of the sham electroacupuncture treatments in the control group, the needles did not penetrate the skin at all in order to avoid the neurophysiological and neurochemical responses that arise due to the stimulation of the cutaneous receptors. The side effects observed over the course of the present study were hematoma/bluish discoloration in the vicinity of the LI4 point in 1 out of the 22 (4.5%) patients in the treatment

group. The hematoma disappeared on the third day after acupuncture treatment. Other side effects such as shock, infection, or allergic reactions were not encountered in this study.

Electroacupuncture therapy can be used as additional therapy in patients scheduled to undergo surgery for impacted mandibular third molar, leading to a reduction in pain intensity and postoperative trismus and providing for longer pain-free intervals [17,18]

One of the limitations of this study was that the patients were not divided based on class or the degree of tooth impaction, which could affect the extent of tissue damage and complications that arise after surgery. The greater the trauma caused by the surgical procedure, the greater the inflammatory process that can affect the pain-free interval, intensity of pain, and interincisal distance after surgery.

Conclusions

The combination of electroacupuncture and medication prolonged the pain-free time interval, reduced pain intensity, and increased the interincisal distance in patients after impacted mandibular third-molar surgery. Further clinical studies are required to validate the findings of this study.

Declaration of Interest

The authors declare that there are no conflicts of interest.

References

1. Juodzbalys G, Daugela P. Mandibular third molar impaction: Review Of Literature And A Proposal Of Classification. Journal of oral and maxillofacial research. 2013.
2. Wu S, Yamaguchi H, Shibutani K. Effect Of Acupuncture On Perception Treshold: A Randomised Controlled Trial. Acupunct Med 2012;30:32–36.
3. Osunde OD, Adebola RA, Omeje UK. Management Of Inflammatory Complication In Third Molar Surgery: A Review Of The Literature. African health sciences. 2011;11(3).
4. Katzberg RW, Westerson PL. Diagnosis Of The Temporomandibular Joint 1st. Ed., Philadelphia: EB. Saunders Company; 1994, 13-21.
5. Tavares M, Machado A, Motta B. Electrocupuncture Efficacy On Pain Control After Mandibular Third Molar Surgery. Braz Dent J 2007;18(2).
6. Rosted P. The Use Of Acupuncture In Dentistry. Acupuncture in medicine 1988; 16 (1).
7. Tavares M, Machado A, Motta B. Electrocupuncture Efficacy On Pain Control After Mandibular Third Molar Surgery. Braz Dent J 2007;18(2):158-62.
8. Kassis J. Effectiveness of Chinese Acupuncture on Pain Relief Following Surgical Removal of Impacted Third Molars: A Self Control Clinical Trial. Journal of Oral And Maxillofacial Surgery, Medicine And Pathology 2017;29(1):6-9.
9. Shan Y, Wang Z, Zhao Z, Zhang M. An fMRI Study Of Neuronal Specificity In Acupuncture: The Multiacupoint Siguan And Its Sham Point. Hindawi publishing corporation evidence-Based complementary and alternative medicine. 2014; 2014: 1-7.
10. World Health Organization. WHO Standard Acupuncture Point Locations In The Western Pacific Region. 2008.
11. Kitade T, Ohyabu H. Analgesic Effect of Acupuncture on Pain After Mandibular Wisdom Tooth Extraction. Acupunct Electrother Res. 2000;25(2):109-15.
12. Vaishali M, Roopashri G, David M. Trismus. IJDA *2010;2(3):303-308.*
13. Xiang A, Cheng K, Shen X. The Immediate Analgesic Effect Of Acupuncture For Pain: A Systematic Review And Meta-Analysis. Review Article of Hindawi volume 2017, Article ID 3837194. 2017
14. McDonald JL, Cripps AW, Smith PK. Mediators, Receptors And Signalling Pathways In The Anti Inflammatory And Antyhyperalgesic Effect Of Acupuncture. Hindawi Publishing Corporation Evidence based Complementary And Alternative Medicine. 2015.
15. *Fang J, Du J, Liang Y.* Intervention of Electroacupuncture on Spinal p38 MAPK/ATF-2/VR-1 Pathway In Treating Inflammatory Pain Induced by CFA in Rats. Research Molecular Pain 2013, 9:13.
16. *Lawrence T.* The Nuclear Factor NF-κB Pathway in Inflammation. Cold Spring Harbor Perspectives In Biology 2009;1:a001651.
17. Coe T. The effect of acupuncture on pain and swelling after a day case molar teeth extraction under general analgesia. Ambulatory surgery 7. 1999.
18. Fragiskos FD. Oral Surgery. In: Fragiskos FD, Surgical Extraction Of Impacted Teeth. Verlag Berlin Heidelberg, Springer 2007. p. 121-177.