

# Results of combat medic junctional tourniquet training: a prospective, single-blind, randomized, cross-over study

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## ABSTRACT

**BACKGROUND:** Bleeding remains the leading cause of potentially preventable deaths both in military and civilian pre-hospital trauma settings. Conventional extremity tourniquets do not control bleeding if an iliac artery or a common femoral artery is injured. Stopping junctional bleeding is particularly challenging and requires the use of specifically designed junctional tourniquets. SAM® Junctional Tourniquet (SJT®; United States of America) and Tactical Abdominal Junctional Tourniquet (T-AJT®, Fora Group Türkiye) have been actively used by Turkish security forces. This study questioned the effect of training on combat medics' successful junctional tourniquet applications and application times (AT).

**METHODS:** Our research on two different junctional tourniquet models was designed as a prospective randomized, crossover, single-blinded study. All 40 participants in the study were attendees of a 12-week combat medic training course with updated medical approvals, which were used as an eligibility criterion. Randomization was performed by drawing T-AJT®-SJT cards. The study consisted of pre-training and after-training tourniquet application phases. In each study phase, all participants' AT and the presence or absence of arterial flow were recorded for each group. Finally, the combat medics were presented with a 6-question survey.

**RESULTS:** Although training increased successful T-AJT® application rates, training was not statistically significantly associated with successful applications for any tourniquet types ( $p>0.05$ ). The pre-training phase ATs for SJT® and T-AJT® were  $55\pm 11.8$  and  $93.8\pm 2.9$  seconds, respectively, and the difference was statistically significantly different ( $p<0.001$ ). Likewise, after-training phase ATs for SJT® and T-AJT® were  $49\pm 22.6$  and  $79.2\pm 17.5$  seconds, respectively, and participants' SJT® ATs were significantly shorter ( $p<0.001$ ). Overall, when participants' applied any of the tourniquet unsuccessfully, the odds of participants' lower Visual Analogue Scale scores were 0.2 (95% CI [0.08, 0.49].  $p<0.001$ ).

**CONCLUSION:** Our study basically investigates the effects of training on effective tourniquet application. Unfortunately, our after-training success rates remained unsatisfactory when compared to other studies. This is also the first study on T-AJT® tourniquet application, and further studies on its efficacy are also required.

**Keywords:** Combat medic; SAM junctional tourniquet; tactical abdominal junctional tourniquet; training.

## INTRODUCTION

Bleeding remains the leading cause of potentially preventable deaths, both in military and civilian pre-hospital trauma settings.<sup>[1-3]</sup> Modern weapons systems and improvised explosive devices create multiple amputations, severe perineal injuries,

and pelvic disruptions. In urban combat environments, junctional injury rates sustained by Turkish security forces have increased significantly. Stopping junctional bleeding is particularly challenging and requires the use of specifically designed junctional tourniquets.<sup>[4-7]</sup> Junctional tourniquet application times (AT) are generally longer than conventional tourniquets

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and require a combat medic for application. Hence, junctional injuries and associated bleeding have been a critical research field.<sup>[8,9]</sup>

Junctional tourniquets are compression devices that compress the aorta, axillary artery, and femoral vascular structures, designed for tactical casualty care.<sup>[2,10,11]</sup> Efforts to stop junctional bleeding-related prehospital deaths have led to the development of FDA-approved junctional tourniquets.<sup>[6,12-14]</sup>

Although there are several other tourniquets designed to control junctional bleeding, the SAM<sup>®</sup> Junctional Tourniquet (SJT<sup>®</sup>, USA) and the Tactical Abdominal Junctional Tourniquet (T-AJT<sup>®</sup> Fora Group Defense Ltd., Türkiye) have been actively used by Turkish security forces.<sup>[14]</sup> The T-AJT<sup>®</sup>, which is similar in design to the AAJT, has been designed for application to the umbilicus, the axilla, and the groin. The SJT<sup>®</sup> also has an approved indication for pelvic immobilization.

These tourniquets are present to some extent for use by medical personnel, and there is an ongoing debate about whether their presence should include the combat medic level. The authors of this study questioned the effect of training on combat medics' successful junctional tourniquet applications on the groin region and AT. In a non-bleeding casualty-first responder combat medic scenario, the above question has not been tested in Türkiye yet. Thus, the purpose of this study is to fill this critical knowledge gap.

We hypothesized that training for both SJT<sup>®</sup> and T-AJT<sup>®</sup> tourniquets would increase successful groin application rates, defined as occlusion of arterial blood flow by a Doppler ultrasound, and decrease ATs when compared to the pre-training period. Our Ho was that there would be no statistically significant differences between the pre- and post-training successful application rates and ATs of SJT<sup>®</sup> and T-AJT<sup>®</sup> tourniquets.

## MATERIALS AND METHODS

Approval for the study has been obtained from the Yeditepe University Clinical Research Ethics Committee (April 24, 2020/1194). As the study would be conducted using medical devices, an application dated September 11, 2020 and numbered E417366 has been made to the Turkish Ministry of Health Medicine and Medical Devices Agency, and an approval dated September 21, 2020, has been obtained. Our research on two different junctional tourniquet models was designed as a prospective randomized, crossover, single-blinded study. A power analysis with an 80% power recommended 24 participants for the study.<sup>[15,16]</sup>

According to Turkish Military Health Requirements and Police Force Health Regulations, all personnel are periodically examined and approved by the multidisciplinary Board of Health for their specified duty assignments after detailed medical examinations and tests. All 40 participants in the study were attendees of a 12-week combat medic training

course with updated medical approvals, which were used as an eligibility criterion. This course is given at the University of Health Sciences, Yeditepe Training and Research Hospital, which is also the center where the study was conducted. The participants were questioned about any recent medical problems and extremity trauma, and they received a complete consent form pertaining to the risks and details of the study. Written consent was obtained from all participants.

Currently, the combat medic training course agenda involves indications-contraindications for tourniquet (extremity and junctional) application, the theory behind their use, a hands-on introduction, where the junctional tourniquets should be applied, common mistakes during application, and application videos.

Randomization was performed by drawing T-AJT-SJT cards. The study consisted of pre-training and after-training phases. Bilateral common femoral artery pulse points below the inguinal ligament were selected for the application of a junctional tourniquet. All participants were randomly assigned to both different tourniquet groups; thus, each tourniquet group involved 20 participants in each study phase. These 20 participants in each group performed the application on both the left and right groin regions. (Fig. 1) The user that applied the tourniquet to the subject was the subject of the next application, and the initial subject was the second user. The sequential use of both tourniquets in two different study phases led to eight tourniquet applications for each subject. Participants' age, body mass indexes (BMI), blood pressure, and pulse rates have been measured and recorded. Afterward, the pre-training phase was conducted. On conclusion of the pre-training phase, participants were briefed about their potential failure reasons, and both junctional tourniquets were handed to participants for hands-on training under supervision. Then, the after-training phase of the study was conducted.

In a simulated combat noise environment, participants were asked to quickly apply the junctional tourniquet to the right



**Figure 1.** (a,b): T-AJT junctional tourniquet applications. (c,d): SJT junctional tourniquet applications.

groin area, and afterward, posterior tibial artery was examined for an indication of blood flow using a Doppler ultrasound device (GE, Logiq Book XP, USA). In each study phase, all participants' AT and the presence or absence of arterial flow were recorded for each participant. The absence of blood flow in the first 15 s and the last 15 seconds of the post-application 1-minute period has been considered successful.<sup>[14]</sup> The presence of pain, which seemed to intensify when the tourniquets had been appropriately applied, was a major question that required to be tested for the authors of the study. Thus, participants were asked to rate their pain perception on a ten-scale Visual Analogue Scale (VAS) score. Participants were blinded to the test results during the study. After each study phase, each participant was assessed for the presence of any adverse events (any sign or symptom) or complications like neuropraxia, except for the pain that quickly resolved after the release of tourniquet tension.

Finally, the prospective combat medics were presented with a 6-question survey that queried their perceptions, the practicality and effectiveness of these tourniquets, and their recommendations for future development of each device were received.

All data were analyzed using SPSS V.22 (Armonk, New York, USA, IBM Corp.). Continuous, ordinal, and nominal data were summarized as mean $\pm$ SD, median (mode), and percentages, respectively. The differences in successful applications of both tourniquets were analyzed using McNemar's test, Fischer's exact test, and Somer's D test as appropriate. The differences between the ATs were analyzed using an independent sample t-test. The effect of training on ATs for both tourniquets was analyzed using a paired sample t-test. Ordinal logistic regression analysis was used in order to determine if tourniquet types and successful and unsuccessful tourniquet applications had any statistically significant effect on participants' VAS scores. The Mann-Whitney U test was used to analyze the differences between survey ordinal data. Statistical significance was set at  $p < 0.05$ .

## RESULTS

Participants' mean age, pulse rate, mean arterial pressure, and BMI values were  $27.3 \pm 2.8$  years,  $79.6 \pm 10$  beats per minute,  $92.2 \pm 6.2$ , and  $24.8 \pm 2.5$ , respectively. All participants were right-handed, and no complications were reported by the participants. Statistical analyses showed no statistically significant associations between the above variables and successful or unsuccessful tourniquet applications. The success rates and ATs between the left and right groin regions were also not statistically significantly different within any groups ( $p > 0.05$ ). Thus, the results of the statistical analysis between the left and right groin regions are not presented for practical purposes. Participants showed no adverse events or complications after the completion of the study.

### Success rates

The results of successful performances in two successive study phases are shown in Table 1. Although training increased successful T-AJT<sup>®</sup> application rates, training was not statistically significantly associated with successful applications for any tourniquet type ( $p > 0.05$ ). When each phase of the study and overall success rates were analyzed, the differences between each junctional tourniquet's type were also not statistically significant ( $p > 0.05$ ).

### AT

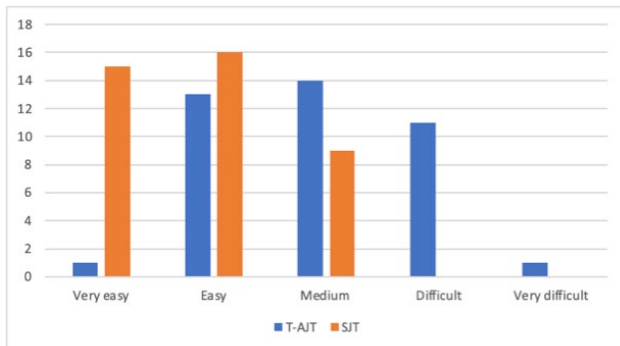
The pre-training phase ATs for SJT<sup>®</sup> and T-AJT<sup>®</sup> were  $55 \pm 11.8$  and  $93.8 \pm 2.9$  seconds, respectively, and the difference was statistically significantly different ( $p < 0.001$ ). Likewise, the after-training phase ATs for SJT<sup>®</sup> and T-AJT<sup>®</sup> were  $49 \pm 22.6$  and  $79.2 \pm 17.5$  seconds, respectively, and participants' SJT<sup>®</sup> ATs were significantly shorter ( $p < 0.001$ ). Interestingly, when the effect of training on these tourniquets' ATs was analyzed, we found that T-AJT<sup>®</sup> ATs decreased  $14.6 \pm 20.5$  seconds in the after-training phase, and the difference was statistically significant ( $p = 0.005$ ). The ATs of SJT<sup>®</sup> were shorter ( $5.7 \pm 18$  s) in the after-training phase; however, the difference was not statistically significant ( $p = 0.17$ ) [Table 2].

**Table 1.** Successful application rates T-AJT<sup>®</sup> and SJT<sup>®</sup> in both study phases

Junctional Tourniquet types	Pre-training phase success (left/right groin)	After-training phase success (left/right groin)	Overall success (%)
T-AJT <sup>®</sup>	26/40 (65%)	30/40 (75%)	70%
SJT <sup>®</sup>	22/40 (55%)	22/40 (55%)	55%

**Table 2.** Application Times (ATs) for T-AJT<sup>®</sup> and SJT<sup>®</sup> in both study phases.

Junctional Tourniquet types	Pre-training phase AT	After-training phase AT	
T-AJT <sup>®</sup>	$93.8 \pm 2.9$	$79.2 \pm 17.5$	$p = 0.005$
SJT <sup>®</sup>	$55 \pm 11.8$	$49 \pm 22.6$	$p = 0.17$
	$p < 0.001$	$p < 0.001$	



**Figure 2.** Distribution of perceived level of difficulty ratings.

**Pain**

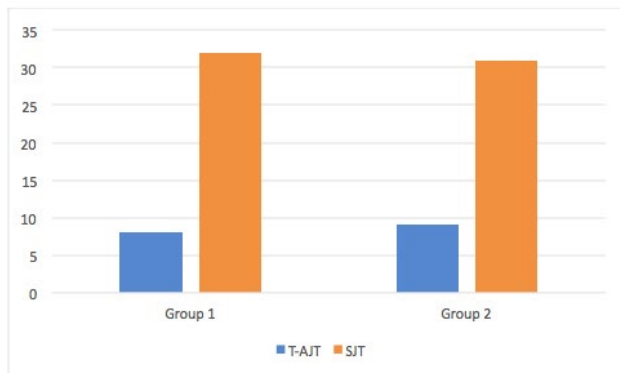
When the participants applied the T-AJT® and SJT® successfully, the median VAS scores were 7 (mode, 6) and 6 (mode, 4), respectively. Moreover, the odds of increased pain perception if participants successfully applied the T-AJT® were 3.45 (95% CI [1.51, 7.87]) (p=0.03). Overall, when participants applied any of the tourniquets unsuccessfully, the odds of participants' lower VAS scores were 0.20 (95% CI [0.08, 0.49]) (p<0.001).

**Survey Results**

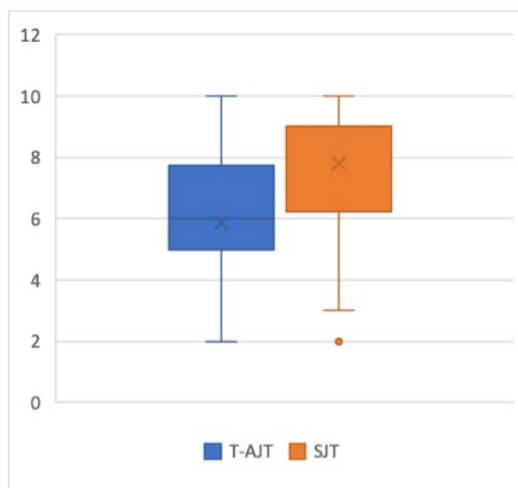
Upon completion of the study, each participant was privately delivered a 6-question survey that also included a section for their comments. No verbal interaction was allowed between participants during the survey.

Participants were asked to rate their difficulty of application experiences for both tourniquets on a 5-level scale (Levels: 1= very easy → 5= very difficult). The median value of difficulty of application level rating for T-AJT® and SJT® was 3 (mode, 4) and 2 (mode, 2), respectively, and the difference was statistically significant (p<0.001) (Fig. 2).

Participants' confidence in T-AJT® and SJT® was also surveyed. In Group 1, they were asked which tourniquet they preferred to have applied, and in Group 2, they were asked which tourniquet they would choose to apply to a casualty. Eighty percent (n=32) and 78% (n=31) of participants chose SJT® for



**Figure 3.** Participants' confidence ratings on T-AJT® and SJT®.



**Figure 4.** Participants' T-AJT® and SJT® effectivity ratings

group 1 and 2 questions, respectively. The analysis showed no statistically significant difference (p>0.05) (Fig. 3).

On a 10-level scale (1-inadequate, 10-excellent), the blinded participants were asked to rate the efficacy of T-AJT® and SJT® for use in tactical fields. The median effectivity ratings of T-AJT® and SJT® were 6 (mode, 8) and 9 (mode, 8), respectively, and the difference was statistically significant (p<0.001) (Fig. 4).

**DISCUSSION**

Despite its occasional occurrence during the fight against terrorism, critical urban combat lessons have been learned by Turkish military medical personnel, which prompted the increased availability of T-AJT® and SJT®. The exact truth about the application of a junctional tourniquet on a bleeding casualty is “do it right and do it fast, if possible.” Thus, all relevant studies in the literature primarily focus on efficacy and, secondarily, on the application time of different junctional tourniquet types. Lyon et al. studied the efficacy of AAJT on both the axillary and groin regions of 13 volunteers.<sup>[17]</sup> The authors seem to have applied the tourniquet, and showed 100% success rates for both regions, and concluded that the AAJT was uniformly effective. In contrast to the above study, Kragh et al. tested the application success rates of participants.<sup>[14]</sup> They applied the AAJT and SJT® tourniquets to the abdomen (to control bleeding from pelvic injuries) and groin region, respectively. Success rates for AAJT and SJT® were 27% and 93%, respectively. In another study by Kragh et al. the SJT® success rate was 100% in the groin area.<sup>[18]</sup> Chen et al., however, studied the applications of AAJT and SJT® tourniquets to the groin by the combat medics, and the reported success rates were 100% and 82%, respectively.<sup>[19]</sup>

Meusnier et al. published a study on the effectivity of SJT® that was applied to the groin region by trained military nurses.<sup>[20]</sup> They showed that the successful SJT application rate was 86.8%. On the other hand, Flecha et al. compared the

performances of combat medics and combat lifesaver personnel after a single junctional tourniquet application on mannequins for training purposes.<sup>[21]</sup> They used SJT<sup>®</sup> and JETT (Junctional Emergency Treatment Tool), and success rates for each tourniquet were both 40%. They also reported that all failed attempts were due to participants' inability to achieve adequate tourniquet pressure (180 mmHg) within 240 s. In our study, unfortunately, participants' pre-training and after-training success rates were 55% for SJT<sup>®</sup>. The participants' successful T-AJT<sup>®</sup> application rates were also not as high as the reports above, which only increased from 65% to 75% in the after-training phase. We hereby present the first efficacy study on T-AJT<sup>®</sup>. The authors of this study studied and demonstrated that training is required for successful tourniquet applications and decreased ATs in their previous research.<sup>[22]</sup> They also designed a second study to achieve 100% tourniquet success rates.<sup>[23]</sup> In the present study, the two major causes of failure for both tourniquet types were inadequate tourniquet pressure and inadequate belt tightening-related tourniquet dislocation, which might be due to participants' high stress levels during rushed applications. Especially SJT<sup>®</sup> requires precise application on the pulse point as its pressure cuff is small and requires proper application. When inflated, the SJT<sup>®</sup> device remains unstable and may easily dislocate, which may explain the low success rates despite proper training. Our observation is supported by Gasparly et al.'s conference abstract, which reported 43% success rates of SJT<sup>®</sup> on litter-carried patients.<sup>[24]</sup>

Undeniably, survival rates for bleeding trauma patients are inversely proportional to the time it takes to stop bleeding. Hence, in our study, demonstrating decreased ATs and increased success rates were anticipated outcomes in the after-training period. The ideal successful application time for any given junctional tourniquet type has not been established in the literature and appears to require extensive medical team training to reach an ideal AT. A systematic review and meta-analysis have been published on the effectiveness of several different junctional tourniquet types.<sup>[4]</sup> The mean ATs for AAJT and SJT<sup>®</sup> have been reported to range between 98 s and 34–174 s, respectively. For the SJT<sup>®</sup>, the pooled time for the application was 101 s. Our study showed that training caused a decrease in both tourniquet ATs; however, the SJT AT was not significantly lower, which seems to be due to the ease of SJT application. Both tourniquet types require passing the belt behind the pelvis or hip, which means that the patients' help by raising their pelvis may cause faster ATs. Our study involved an uncooperative casualty scenario, which may have increased the difficulty of applications, hence the T-AJT<sup>®</sup> ATs. Moreover, T-AJT<sup>®</sup> needs significantly more inflation for adequate pressure, and a larger pump volume could also decrease its ATs.

Generally, pain appears to be unignorable when junctional tourniquets are applied. The association between higher pain scores and successful applications was another research ques-

tion for the authors of the study. Median pain scores for SJT<sup>®</sup> and AAJT have been reported to range between 3.5 and 4.3 and 4, respectively.<sup>[4]</sup> On the other hand, our study demonstrated that the median pain scores for SJT<sup>®</sup> and T-AJT<sup>®</sup> were 6 and 7, respectively. T-AJT<sup>®</sup> pain scores were significantly higher. Moreover, we found that successful T-AJT<sup>®</sup> applications were associated with significantly higher pain scores, while lower pain scores were significantly associated with unsuccessful T-AJT<sup>®</sup> and SJT<sup>®</sup> applications. In this way, we may have found an answer to another research question, which may be used during training worldwide.

Blinded participants' assessments of either tourniquet type have significantly contributed to our study findings. As mentioned earlier, all participants personally applied and were applied both tourniquets. In contrast to our efficacy test results, survey results revealed that participants favored SJT<sup>®</sup> over T-AJT<sup>®</sup>. Similarly, participants in other studies also preferred SJT<sup>®</sup> over other junctional tourniquet types.<sup>[20,21]</sup> Compared to the T-AJT<sup>®</sup>, the SJT<sup>®</sup> is smaller and lighter; its application causes less pain and can be applied more quickly. Future developers of junctional tourniquets may need to consider these findings, as final users' preferences are also of critical importance.

Our study has many limitations, and our findings should be interpreted cautiously as they only focus on the impact of participant training. We only preferred the currently available junctional tourniquets in the military and showed that these tourniquets may theoretically achieve arterial occlusion in research settings. Our findings do not reflect the military medics' junctional tourniquet applications in a combat environment. Combat-related junctional injuries may be associated with severely disrupted anatomy, and published data on the efficacy of these tourniquets on actual bleeding casualties is required.<sup>[4]</sup> Our study design also does not provide data on litter-carried participants or applications in low-light environments to further complicate applications, which also needs to be addressed by future studies.

## CONCLUSION

Our study basically investigates the effects of training on effective tourniquet application. Unfortunately, our after-training success rates remained unsatisfactory when compared to other studies. This is also the first study on T-AJT<sup>®</sup> tourniquet application, and further studies on its efficacy are also required. As the first trial on junctional tourniquets in Türkiye, our study may increase the awareness of the trauma medical community on this subject and encourage further studies after this initial report.

**Ethics Committee Approval:** This study was approved by the Yeditepe University Ethics Committee (Date: 22.04.2020, Decision No: 1194).

**Peer-review:** Externally peer-reviewed.

**Authorship Contributions:** Concept: Ş.K., A.Ü.; Design:

Ş.K., A.Ü.; Supervision: Ş.K., A.Ü.; Resource: Ş.K., A.Ü., R.Ş., B.K., G.A.; Materials: Ş.K., A.Ü., R.Ş., B.K., G.A.; Data collection and/or processing: Ş.K., A.Ü.; Analysis and/or interpretation: Ş.K., A.Ü.; Literature search: Ş.K., A.Ü.; Writing: Ş.K., A.Ü.; Critical review: Ş.K., A.Ü.

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## ORİJİNAL ÇALIŞMA - ÖZ

**Muharip sıhhiye bileşke turnikesi eğitiminin sonuçları: Prospektif, tek kör, randomize, çapraz çalışma****Şahin Kaymak,<sup>1</sup> Aytekin Ünlü,<sup>1</sup> Rahman Şenocak,<sup>1</sup> Bilgi Karakaş,<sup>1</sup> Gökhan Arslan,<sup>2</sup> Mehmet Eryılmaz,<sup>1</sup> Nazif Zeybek,<sup>1</sup> Ali İhsan Uzar<sup>1</sup>**<sup>1</sup>Sağlık Bilimleri Üniversitesi, Gülhane Eğitim ve Araştırma Hastanesi, Genel Cerrahi Anabilim Dalı, Ankara, Türkiye<sup>2</sup>Sağlık Bilimleri Üniversitesi, Gülhane Eğitim ve Araştırma Hastanesi, Kalp Damar Cerrahisi Anabilim Dalı, Ankara, Türkiye

**AMAÇ:** Kanama hem askeri hem de sivil travmalarda hastane öncesi önlenebilir ölümlerin önde gelen nedeni olmaya devam etmektedir. Geleneksel ekstremite turnikeleri iliak veya common femoral arter yaralanmalarında kanamayı kontrol edemez. Bileşke bölgelerinin kanamasını durdurmak özellikle zordur ve özel olarak tasarlanmış bileşke turnikelerinin kullanılmasını gerektirir. SAM® Bileşke Turnikesi (SJT®, Amerika Birleşik Devletleri) ve Taktik Abdominal ve Bileşke Turnikesi (T-AJT®) Fora Grup Ltd. Türkiye) Türk güvenlik güçleri tarafından aktif olarak kullanılmaktadır. Bu çalışmada eğitimin muharip sıhhiyecilerin bileşke turnikesi uygulamalarındaki başarı ve uygulama süreleri üzerindeki etkisi sorgulanmıştır.

**GEREÇ VE YÖNTEM:** İki farklı bileşke turnikesi modeli üzerinde yaptığımız araştırma, ileriye dönük, randomize, tek kör çapraz bir çalışma olarak tasarlanmıştır. Katılımcıların tamamı, uygunluk kriteri olarak kullanılan güncel tıbbi onaylara sahip 12 haftalık muharip sıhhiye eğitim kursunun katılımcılarıyla. Randomizasyon T-AJT ve SJT kartları çekilerek gerçekleştirildi. Çalışma, eğitim öncesi ve eğitim sonrası turnike uygulama aşamalarından oluşmuştur. Her çalışma aşamasında, tüm katılımcıların uygulama süreleri ve arteriyel kan akışın varlığı veya yokluğu her grup için kaydedildi. Son olarak, katılımcılara 6 soruluk bir anket sunulmuştur.

**BULGULAR:** Eğitim başarılı T-AJT uygulama oranlarını artırmasına rağmen hiçbir turnike türü için başarılı uygulamalarla istatistiksel olarak anlamlı şekilde ilişkili değildi ( $p>0.05$ ). SJT ve T-AJT için eğitim öncesi turnike uygulama süreleri  $55 \pm 11.8$  ve  $93.8 \pm 2.9$  saniye olup aradaki fark istatistiksel olarak anlamlı bulundu ( $p<0.001$ ). Benzer şekilde, SJT ve T-AJT için eğitim sonrası turnike uygulama süreleri  $49 \pm 22.6$  ve  $79.2 \pm 17.5$  saniye ve katılımcıların SJT uygulama süreleri önemli ölçüde daha kısa bulundu ( $p<0.001$ ). Genel olarak, katılımcılar turnikelerden herhangi birini başarısız bir şekilde uyguladığında, katılımcıların daha düşük görsel analog ölçeği (GAÖ) puanları alma olasılığı 0.2 idi (%95 CI [0.08, 0.49],  $p<0.001$ ).

**SONUÇ:** Çalışmamızda temel olarak eğitimin turnike uygulaması üzerindeki etkileri araştırılmıştır. Ne yazık ki, eğitim sonrası başarı oranlarımız diğer çalışmalarla karşılaştırıldığında yetersiz kalmıştır. Çalışmamız aynı zamanda T-AJT turnike uygulaması üzerine yapılan ilk çalışma olup, turnikenin etkinliği üzerine daha fazla çalışmaya ihtiyaç vardır.

**Anahtar sözcükler:** Eğitim; muharip sıhhiye; SAM bileşke turnikesi; taktik abdominal bileşke turnikesi.

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