MEDS Chinese Medicine (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/medcm.2024.060401
ISSN 2616-1753 Vol. 6 Num. 4

Progress of clinical research on stenosing tenosynovitis of flexor tendon with different selection points of needle knife

Xiao Yan[1,a], Hui Jianrong[1,2,b,*], Huang Jing[1,c]

[1]Shaanxi University of Chinese Medicine, Xianyang, 712046, China
[2]Affiliated Hospital of Shaanxi University of Chinese Medicine, Xianyang, 712000, China
[a]1157680754@qq.com, [b]jrjianrong99@163.com, [c]1037783767@qq.com
[*]Corresponding author

Keywords: Needle knife; different selection points; stenosing tenosynovitis of flexor tendons

Abstract: As a minimally invasive technique, needle knife therapy has shown remarkable efficacy in the treatment of stenosing tenosynovitis of flexor tendons. The accuracy of point selection directly affects the success rate of needle knife treatment, in which palpation is the traditional and critical means to determine the treatment point. As the main basis for point selection, hard nodules and pressure points help doctors identify the lesion area. With the development of medical technology, modern imaging techniques, such as ultrasound guidance, have been introduced into needle knife treatment, improving the accuracy of point selection and the safety of treatment. This review discusses the improved ideas of point selection in needle knife therapy, emphasizing the combination of modern imaging techniques and anatomical basic research to achieve more accurate lesion localisation. At the same time, it is proposed to look for areas free of nerves and blood vessels when selecting points in order to follow the principle of minimal damage and reduce the impact on the surrounding normal tissues. With this approach, a more personalized and precise treatment plan can be provided to patients, thus improving the treatment effect and reducing postoperative complications.

1. Introduction

Stenosing tenosynovitis of the flexor tendon, also known as trigger finger (TF), is associated with overactivity or trauma to the finger, and the clinical symptoms mainly include unfavourable flexion and extension of the affected finger, and a bouncing movement when the finger is stretched with force, which looks like a trigger. With the accelerated pace of social life, TF has gradually become a common clinical disease in recent years. Currently, the main clinical treatments for TF include needle knife treatment[1], external application of traditional Chinese medicine[2], acupuncture and physiotherapy[3], surgery, and other treatments[4], shockwave [5]and other rehabilitation treatments. The latest clinical research has found that the treatment of TF with needle knife has the characteristics of fewer treatments and significant effect. The purpose of this paper is to provide a better choice for the treatment of TF by summarising the commonly used acupuncture knife selections in the clinic.

After the research of many medical practitioners, the use of needle knife is favoured as the preferred method of treating TF[6]. Despite the fact that TF is a common condition, there is a lack of uniformity in the clinical grading of TF. According to the classification method of Greene's Hand Surgery, TF is classified into four different severity levels, the first two of which are usually suitable for treatment with conservative treatment methods[7]. Therefore, doctors should accurately assess the patient's condition based on this grading standard when formulating treatment plans, and accordingly choose the appropriate needle knife treatment points to achieve the best therapeutic effect.

2. Knowledge of TF in Chinese and Western medicine

2.1. Chinese medicine's understanding of TF

According to Chinese medicine, TF belongs to the category of ‘tendon paralysis’, and its causes are mostly related to strain injury to the meridians and tendons, or cold and dampness attacking the veins, resulting in obstruction of the meridians, poor qi and blood flow, and qi stagnation and blood stasis. Traditional Chinese medicine treats TF with various methods, including acupuncture, moxibustion, and acupoint injection[8][9][10]. In recent years, some modern methods such as microwave irradiation at acupoints have also been applied to the treatment of this disease, resulting in increasing efficacy. In treating this disease, Chinese medicine focuses on regulating qi and blood, dredging meridians and collaterals, in order to reduce swelling and pain, and restore the function of the affected finger. The treatment will be based on the severity of the disease, selecting the appropriate treatment methods, such as Chinese medicine fumigation can be used when the disease is mild, and when the disease is severe, small needle knife can be used to select the points for stabbing and cutting. Chinese medicine also emphasises prevention and conditioning, such as avoiding overwork, paying attention to warmth, avoiding cold and dampness, as well as preventing the occurrence of this disease through appropriate hand exercises [11].

2.2. Modern medical understanding of TF

The pathogenesis of TF may be related to factors such as high hand activity, reduced secretion of synovial fluid in the tendon sheath, external compression of the tendon sheath, and long-term friction [12]. These factors lead to thickening of the tendon sheaths and tendons and narrowing of the intratendinous channels, which further exacerbate friction and produce inflammation. Patients with TF often have popping and rattling sounds during flexion and extension of the affected finger, accompanied by pain, unfavourable flexion and extension, swelling, and functional limitation of the affected finger. In addition, imaging tests such as ultrasonography can help doctors observe the condition of tendon sheaths and tendons, which is important for diagnosis and treatment. Modern medical treatments for TF include non-surgical and surgical treatments. There are various methods of non-surgical treatment, such as topical application of fusolin emulsion and intratendinous injection of hormonal drugs [13]. Surgical treatment is usually used when non-surgical treatment fails [14]. Preventive measures include avoidance of prolonged repetitive hand movements, appropriate rest and hand exercises, and the use of a brace to minimise friction and compression of the tendon when necessary [15].

3. Selection of points for needle knife

3.1. Areas with hard nodules at palpation as routine points for needle knife selection in the clinic

As a minimally invasive technique, the effectiveness of needle knife treatment has been widely

recognised in clinical practice. In the treatment of tenosynovitis and other diseases, the selection of the needle knife directly affects the effectiveness and safety of the treatment. The selection of the area of hard nodules as the point of needle entry is based on an in-depth understanding of pathological changes and practical experience. The formation of hard knots is usually associated with local inflammation, tissue fibrosis, or pathological thickening of the tendon glide site.A1 Thickening of the glide site may be due to prolonged tendon friction or accumulation of small injuries, and this thickening causes an increase in local pressure, which in turn affects the normal glide function of the tendon.A1 The formation of hard knots is usually associated with local inflammation, tissue fibrosis, or pathological thickening at the tendon glide site.

In clinical practice, locating the hard knot area through meticulous palpation can provide precise navigation for needle knife treatment. A study by Liu Qiqi [15] showed that selecting the hard knot as the entry point of the needle can effectively alleviate the limitation of movement of the affected finger and improve the quality of life of the patient. The efficacy of this treatment method was remarkable, bringing rapid pain relief and functional recovery to patients. Zhang Hongzhen's study further confirmed the effectiveness of the sclerotomy as the needle entry point [16], with a cure rate of 97.32%. It shows that needle therapy has high application value in the treatment of diseases such as TF. This statistical result of cure rate not only provides clinicians with a strong basis for treatment, but also brings confidence to patients. The 100% cure rate derived from clinical observation by Jiao Yusheng [17] may be limited by the sample size and observation time, but it still demonstrates the potential efficacy of needle knife treatment under specific conditions. This result suggests that needle knife treatment may achieve complete pathological reversal in some cases. Xu Ying used the presence of bead-like nodules at the body surface as the point of needle entry in her selection, and it was found that the efficiency could reach 90.70% [18]. Therefore, choosing the site with hard nodules on palpation as the point of needle knife selection is effective to a certain extent, but due to the limitation of the sample size, this point of selection still needs to be followed up with clinical observation to verify its clinical effect.

3.2. Areas with pressure points on palpation as a routine site for needle knife in the clinic

Under the influence of long-term chronic strain, the constant friction between the flexor tendons of the affected finger and the walls of its fibrous canal may lead to local chronic aseptic inflammation. This inflammatory response causes tissue oedema, which in turn leads to increased pressure within the canal lumen. During clinical examination, when local palpation of the affected area is performed, patients often exhibit significant pressure pain, which is a direct response of the inflamed area to palpation [19].

Yan Pengpeng made similar points in his therapeutic practice, emphasising that when performing needle knife therapy, the high tension or pressure pain points in the affected area should be precisely selected as the entry point for treatment. He further pointed out that the etiology of TF is not only related to long-term chronic strain, but acute injury also plays an important role in its development. Therefore, in clinical treatment, it is important to consider the etiology and pathological changes, i.e., the principle of ‘treating both the symptoms and the root cause’, in order to improve the therapeutic effect[20]. Xie Zhongling chose the pressure-pain point as the entry point of the needle knife and found that using the pressure-pain point as the entry point could effectively reduce the patient's pain[21]. This method of needle knife point selection for the pressure-pain point has become one of the common operations for the treatment of stenosing tenosynovitis of the flexor tendon. Wang Lie, on the other hand, from the perspective of Chinese medicine, believes that the formation of pressure pain points is related to the poor flow of qi in the meridians. When the meridian qi in the meridians is not flowing well due to depression and obstruction, the cumulative effect over a long period of time leads to

localised swelling and pressure pain. Needle knife relieves the symptoms by unblocking the meridians in these areas[22]. This concept not only enriches the theoretical basis of needle knife therapy, but also provides a new perspective for clinical treatment.

In summary, whether based on the pathophysiological mechanisms of Western medicine or the meridian theory of Chinese medicine, needle knife therapy emphasises the identification and utilisation of pressure and pain points in the affected area when selecting points. This precise therapeutic strategy not only helps to relieve patients' immediate symptoms, but also offers the possibility of promoting long-term recovery and functional improvement of the affected area. As clinical practice continues, the point selection method of needle knife therapy will be more refined with a view to achieving optimal therapeutic effects.

4. Application of the idea of improved needle knife point selection

With the wide application of needle knife treatment in TF, clinicians have gradually realised that although the traditional needle knife point selection method is effective, there is still room for further optimisation. Ideas for improving needle knife point selection mainly focus on the following aspects: 1. Combining modern imaging technology to improve the accuracy of point selection with the development of medical imaging technology, such as ultrasound, MRI, etc., doctors can observe the lesions of tendon sheaths and tendons more clearly. Combined with these imaging results, doctors can more accurately determine the lesion site, so as to select a more precise point of needle knife treatment and improve the therapeutic effect.2. Integration of modern anatomical basic research in the process of selecting the point of needle knife, it is possible to integrate anatomical basic research, such as the anatomy and pathophysiology of modern medicine. Through the combination of Chinese and Western medicine, the lesion mechanism can be more comprehensively understood, so as to select more appropriate treatment points.

4.1. Finding abnormal echogenic areas under ultrasound as a modified point selection

In the treatment of TF, the modified needle-knife point selection technique combined with ultrasound guidance has become a precise and safe clinical operation. Yu Chuan combined traditional palpation with modern ultrasound technology through a series of innovative steps to improve the accuracy and safety of treatment [23]. First, the patient's reaction points are identified by palpation, and then ultrasound guidance is used to pinpoint these points. On ultrasound images, these points usually appear as hypoechoic areas, similar to the A-shi points in Chinese medicine theory, which may be due to muscle nodal contractures. Yu Chuan further used iodine povidone to mark these areas on the surface of the skin, ensuring that the needle knife was able to accurately penetrate between the annular ligament and the compressed tendon to achieve effective release. This approach not only improves the accuracy of the treatment, but also reduces damage to the surrounding tissues, speeds up post-operative recovery and alleviates the patient's pain. Ultrasound-guided needle knife treatment significantly improves the therapeutic effect by eliminating local reaction points, changing the biomechanical state, reducing myofascial pressure and improving local blood supply.

The effectiveness of ultrasound-guided needle knife treatment was further confirmed in a study by Yunhua Tax, who pointed out that this method not only improved the cure rate, but also effectively avoided damage to blood vessels, nerves, and tendons while accurately locating the affected finger, significantly reduced the postoperative recurrence rate, and shortened the patient's recovery time[24]. Wang Baojian's study also demonstrated a point selection method combining ultrasound and needle knife, which further improved the safety and effectiveness of the treatment by locating the blood vessels and nerves first, followed by needle knife operation[25]. Hong Jian Chen treated TF by first locating and marking the thickest part of the tendon under ultrasound guidance, and then performing

needle knife release at this site, and the patient recovered well after the operation[26]. Jiang Xi-Wen performed spotting under ultrasound guidance in the musculoskeletal, and it was found that the patients' pain was significantly reduced after needle knife surgery compared with the previous one, and it was not easy to recur after the surgery[27]. Zhang Wenbing performed fixed-point stabbing with ultrasound assistance, and the results showed that the effective cure rate could reach 100% and the long-term prognosis was good [28].

Although point-selective treatment with ultrasound combined with needle knife is a trend in clinical work, in some areas, this method has not yet been popularised due to the limitation of equipment. Therefore, doctors need to rationally choose the most suitable treatment according to their own clinical conditions. With the development of medical technology and the popularity of equipment, we expect this innovative treatment option to bring safer and more effective treatment experience to more patients.

4.2. Finding a nerve- and blood vessel-free site at the TF as a modified selection point

In the process of selecting and positioning points for the implementation of needle knife therapy, the patient's local anatomy must first be analyse in depth. This involves a detailed assessment of the distribution of muscles, tendons, ligaments, and adjacent nerves and blood vessels. Based on this, a thorough consideration of the patient's specific situation, including the area of pain, the degree of restriction of movement, and the history of previous treatments, is used to determine the optimal point of selection for needle knife therapy.

When choosing the modified points, we should follow the principle of minimal damage, avoiding major nerves and blood vessels as much as possible, and at the same time ensuring that the needle knife can act precisely on the diseased tissues and perform its functions of loosening adhesions and promoting local blood circulation. Ouyang Jie pointed out after studying the bulk of the specimen that if the operator is too rough when applying the needle, it may lead to damage to the flexor tendon or the intrinsic nerve of the palmar side of the finger. Therefore, when performing the release operation, only the A1 tendon sheath should be completely released to achieve the desired therapeutic effect and avoid unnecessary injury[29][30][31]. When performing needle knife treatment, we also need to take into account the individual differences and treatment response of patients. Each patient has a different constitution, pain threshold, and sensitivity to treatment, so when selecting points for positioning, doctors should make personalised adjustments according to the patient's specific situation. In addition, careful observation and patient feedback during the treatment process are equally important, as they can help doctors make timely adjustments to the treatment plan to ensure the safety and effectiveness of the treatment. In the actual operation, doctors should adopt gentle and accurate techniques to avoid unnecessary damage to the surrounding normal tissues. At the same time, adequate preoperative communication and appropriate postoperative guidance are also key to improving treatment results and reducing complications. Through the comprehensive use of their own professional knowledge and clinical experience. Combined with the patient's specific situation, it enables the doctor to provide the patient with a more precise and humane needle knife treatment plan.

5. Conclusions

As a highly effective minimally invasive surgical technique, needle knife treatment TF is gradually standing out among conservative treatment methods and showing its unique characteristics. Thanks to the integration of Chinese and Western medical concepts and methods, and the strong support of modern imaging technology, the precision and safety of needle knife point selection have been significantly improved. This improved point selection strategy not only optimise the therapeutic effect, but also effectively reduces the patient's pain during treatment and lowers the risk of recurrence after

surgery. We look forward to more in-depth research results in the future to further explore and improve the point selection method for needle knife treatment of TF, with the aim of bringing safer and more effective treatment options for patients and promoting the continuous progress and development of the field.

References

[1] Deng Yuqin, Zhang Man, Huang Caifeng, et al. The efficacy of medicinal ironing combined with fire dragon pot moxibustion in the treatment of early stenosing tenosynovitis of finger flexor tendons[J]. Journal of Traditional Chinese Medicine, 2023, 32(06):3-6.

[2] XU Weimin. Application of Sitou Tang in combination with extracorporeal shock wave in the treatment of stenosing tenosynovitis of the radial tuberosity[J]. Medical theory and practice, 2024, 37(09):1510-1512.

[3] Lu Qiurong, Pan Yongqin, Xu Yigao, et al. Exploring the idea of acupuncture in the treatment of acute stenosing tenosynovitis from the theory of Huang Di's internal acupuncture[J]. China TCM Emergencies, 2024, 33(04):621-624.

[4] Jill J, Hresko AM, Wes AC. Current status of trigger finger treatment in adults[J]. American Arco Orthopaedic Surgery, 2020, 28(15):e642-e650.

[5] Fei O, Sun H, Li S, et al. Observation on the efficacy of extracorporeal shock wave combined with ultrasound in the treatment of stenosing tenosynovitis of the flexor tendon of the thumb[J]. Journal of Naval Medicine, 2024, 45(03):260-264.

[6] WU Huangchao, SUN Jin, ZHANG Zhongwen. Progress in the treatment of stenosing tenosynovitis of finger flexor tendons [J]. China Medicine Herald, 2024, 21(01):68-71.

[7] Scott WW, Robert NH, William CP, et al. Greene's hand surgery [M]. Beijing: Peking University Medical Press, 2022.

[8] Ma WL, Cheng CH, Cha JQ, et al. Cheng Chunsheng on the application of the theory of 'tendon and bone balance' in the diagnosis and treatment of stenosing tenosynovitis of flexor tendon[J]. Chinese folk therapy, 2022, 30(01):21-23.

[9] YUAN Xue-feng, XUE Jue-ming. Clinical observation on 39 cases of thumb tenosynovitis treated by shallow prick plus moxibustion method[J]. Hunan Journal of Traditional Chinese Medicine, 2016, 32(11):94-96.

[10] Deng Changmao, Huang Al, Wu Xingxing. Clinical observation on the treatment of stenotic tenosynovitis of middle and advanced bunion flexor tendon by hydroentanglement[J]. Modern Hospital, 2019, 19(05):761-763.

[11] Fu LX. Treatment of finger flexor tendonitis by tendon needle[J]. Chinese Electronic Journal of Acupuncture and Moxibustion, 2022, 11(03):133.

[12] XU Shao-Ting, GE Bao-Feng, XU Yin-Kan. Practical Orthopaedics [M].3 ed. Beijing: People's Military Medical Press, 2005:1587.

[13] Xu Fei. Treatment of 40 cases of stenosing tenosynovitis of the radial tuberosity with traditional Chinese medicine fumigation combined with FUTALIN emulsion[J]. China Traditional Chinese Medicine Science and Technology, 2023, 30(04): 795-798.

[14] WANG Shuang, QI Renjing, YUAN Chaoqun, et al. Application of WALANT technique in surgery of stenosing tenosynovitis of hand[J]. Journal of Practical Hand Surgery, 2022, 36(04):464-466.

[15] LIU Qiqi, GONG Yuecheng, ZHU Junshen. Clinical effect of small needle knife in the treatment of stage II and III stenosing tenosynovitis of the thumb[J]. Chinese Medicine Herald, 2021, 18(27):146-149.

[16] Zhang Hongzhen. Evaluation of the efficacy of small needle knife for stenosing tenosynovitis of flexor tendon[J]. Electronic Journal of Clinical Medicine Literature, 2016, 3(14):2756-2757.

[17] Jiao YS. Observation on the efficacy of 38 cases of stenosing tenosynovitis treated with small needle knife[J]. Hebei Traditional Chinese Medicine, 2015, 37(09):1379-1380.

[18] XU Ying, WAN Bijiang, XIAO Qian. Clinical study on modified needle knife procedure for the treatment of stenosing tenosynovitis of II and III degree bunion flexor tendon[J]. Acupuncture and Moxibustion Clinical Journal, 2020, 36(03): 28-33.

[19] Tai Shulin. Finger flexor tendon tenosynovitis[J]. Rheumatism and Arthritis, 2013, 2(03):75-77.

[20] Yan Pengpeng. Clinical study on stenosing tenosynovitis of flexor tendon [J]. Guangming Traditional Chinese Medicine, 2021, 36(17): 2977-2979.

[21] Xie Zhongling. Treatment of 108 cases of stenosing tenosynovitis with small needle knife and sealing[J]. Jiangsu Traditional Chinese Medicine, 2002, (11):48.

[22] WANG Lie, MA Shuai, MA Tieming et al. The identification of excitation pain points and A-shi points, pressure pain points, acupoints, meridian points and junction foci[J]. Research on Combination of Chinese and Western Medicine, 2021, 13(06):415-417.

[23] Yu Chuan, Wang Qingfu, Zong Chenzhong et al. Clinical effect of ultrasound-guided needle knife combined with bunion flexor excitation point inactivation in the treatment of stenosing tenosynovitis of the thumb [J]. China Medical Journal, 2023, 20 (15): 146-150.

[24] ZUAN Yunhua, ZHANG Lan, LI Peiyu et al. Clinical study of ultrasound-guided mini-needle knife in the treatment of stenosing tenosynovitis of flexor digitorum tendon in adults[J]. Journal of Clinical Ultrasound Medicine, 2019, 21(12): 940-943.
[25] WANG Baojian, HU Huang, CHANG Qing et al. Clinical observation on flexor tendon stenosing tenosynovitis treated by needle knife under the guidance of musculoskeletal ultrasound[J]. Chinese Journal of Traditional Chinese Medicine and Orthopaedics, 2019, 27(03):29-32.
[26] Chen Hongjian, Cao Rui, Mao Zaimei. Clinical efficacy of musculoskeletal ultrasound-guided mini-needle knife in the treatment of stenosing tenosynovitis of flexor tendon[J]. Imaging Research and Medical Application, 2023, 7(12): 194-196.
[27] Jiang Xiwen, Zhou Long. Clinical study of ultrasound-guided needle knife treatment of stenosing tenosynovitis of flexor digitorum brevis[J]. Modern Medical Imaging, 2022, 31(3):581-584.
[28] Zhang WB, Yao DW, Wu WX. Observation on the efficacy of ultrasound-guided mini-needle knife in the treatment of stenosing tenosynovitis of flexor tendon[J]. Chinese Acupuncture and Moxibustion, 2019, 39(8):867-870.
[29] Ouyang J, Li YK, Yue YB. Study on the damage of local anatomical structures on the palmar side of fingers by the operation method of trigger finger in needle knife treatment[J]. Chinese Journal of Rehabilitation Medicine, 2010, 25(06): 523-526.
[30] Ouyang J. Anatomical safety study of needle knife treatment of stenosing tenosynovitis[D]. Southern Medical University, 2010.
[31] Zhong Weixing, Ou Yangjie, Chen Zujiang, Li Junhua, Zhang Xuan, Li Yikai. Clinical efficacy of acupuncture in treating patients with stenosing tenosynovitis of the flexor digitorum longus tendon[J]. Journal of Traditional Chinese Medicine, 2023, 32(06):30-32.