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Changes in Collagen and Elastic Fibers in Biological Active Point ST_{36} of Rats after Experimental Acupuncture

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One of the most used methods of Chinese medicine is acupuncture. Point ST_{36} is one of the most important and most commonly used in acupuncture biologically active points (BAP). The target of this study is, by using the classic histological techniques, to identify any changes that occur in the elastic and collagen fibers under the influence of acupuncture needle. We observe deformation and partial demolition of adjacent elastic and collagen fibers and the fascia. In the needle canal elastic and collagen fibers are destroyed**.** Particles of loose connective tissue and fascia, collagen and elastic fibers fall into striated muscle, located in the depth of the point. Changes in the structure of elastic and collagen fibers are most clearly differentiated near the channel formed by the acupuncture needle, but also occur in adjacent areas of skin. The defect seen is with a minimum size and the tissue integrity recovers fast after the removal of the needle.

Key words: acupuncture, BAP – biologically active point, histology, rat, ST_{36}, elastic and collagen fibers.

Introduction

The beginning of the traditional Chinese medicine (TCM) dates back to antiquity [1]. One of the most used methods of Chinese medicine is acupuncture [1, 2]. There is a correlation between the location of acupuncture points and channels in humans and animals [2, 8]. Point ST_{36} is one of the most important and most commonly used [11] in acupuncture biologically active points (BAP). Using the classic histological techniques the aim of this study is to identify changes that occur in the elastic and collagen fibers under the influence of acupuncture needle. For the implementation of the objective we identified the following main tasks: 1) through various coloring methods to visualize the state of the tissues in ST_{36} before and after acupuncture; 2) with a light microscope to identify changes in the state of collagen and elastic fibers in the area of ST_{36} after experimental acupuncture.

Materials and Methods

We carried out the experiments on 14 normotensive rats, Wistar strain of either sex weighing 220-350 g. The point ST_{36} was localized by determining the ratio of standard anatomical structures and with the help of device KWD-808 to measure the skin resistance. Point ST_{36} had been previously marked and we put acupuncture needle for some time. The material was taken and treated without removing the needle for better visualization of the acupuncture channel. The material was cut into paraffin cut with a thickness of 5, 7 to 10 μm. Five different types of staining were applied. We used the following 5 stains: van Gieson, V. G & Elastin, Asan, Mallory, Masson.

Results

After the acupuncture we observed thickening of loose connective tissue adjacent to the acupuncture channel (**Fig. 1**). We observe deformation and partial demolition of adjacent elastic and collagen fibers and the fascia (**Fig. 6**). In the needle canal elastic and collagen fibers are destroyed (**Fig. 3, Fig. 5**). Particles of loose connective tissue and fascia, collagen and elastic fibers fall into striated muscle, located in the depth of the point (**Fig. 2**). Changes in the structure of elastic and collagen fibers are most clearly differentiated near the channel formed by the acupuncture needle, but also occur in adjacent areas of skin (**Fig. 4**). The defect seen is with a minimum size and the tissue integrity recovers fast after the removal of the needle.

Fig. 1. Thickening of loose connective tissue adjacent to the acupuncture channel (van Gieson)

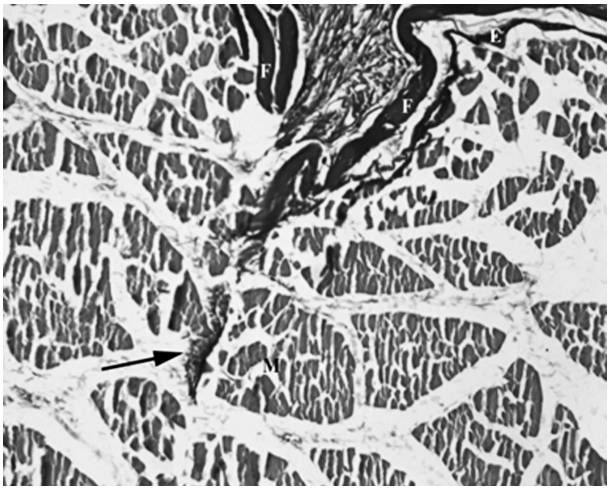

Fig. 2. Deformation and partial demolition of adjacent elastic and collagen fibers and the fascia. M – striated muscle, E – epimysium, F – fascia (arrow) (V. G & Elastin)

Fig. 3. The acupuncture channel (arrow) (Mallory)

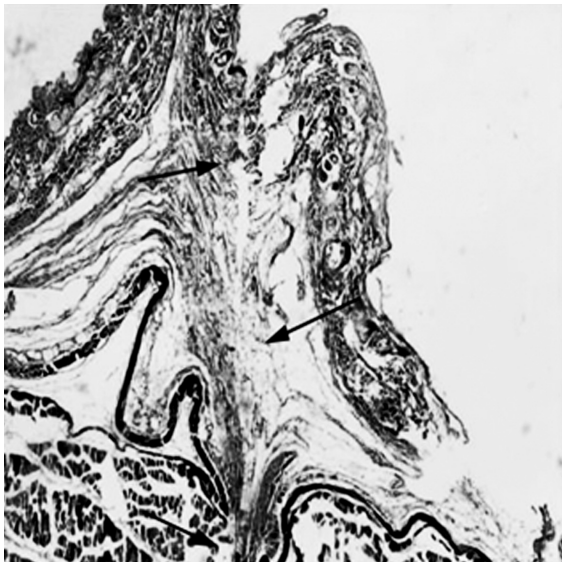

Fig. 4. Deformation of loose connective tissue adjacent to the acupuncture channel (arrow) (Asan)

Fig. 5. The acupuncture channel (arrow) (Masson) A. dermis, B. subcutaneous tissue, C. striated muscle

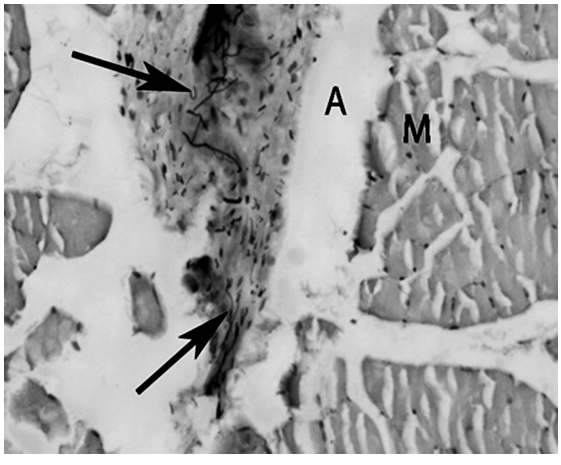

Fig. 6. Deformation and partial demolition of adjacent elastic fibers and the fascia (arrow) (Orcein) A. acupuncture channel, M. striated muscle

Discussion

The results obtained by other authors confirm the destruction to elastic and collagen fibers in the acupuncture channel formed by the needle and there is deformation in the adjacent layers and tissues are confirmed [6, 7, 4, 9, 10]. The defect seen is with a minimum size and the tissue integrity recovers fast after the removal of the needle.

Authors recognize that changes in the elastic and collagen fibers have important effect in acupuncture [3, 5, 8, 11].

Conclusions

As a result of the experimental acupuncture in ST_{36} in rat we observe deformation and partial destruction of the elastic and collagen fibers in the area of acupuncture channel. Changes in the structure of elastic and collagen fibers are most clearly differentiated near the channel formed by the acupuncture needle, but also occur in adjacent areas of skin.

References

1. **Dimitrov, N., D. Sivrev, N. Pirovski, A. Georgieva.** Methods for localization of BAP of the human body. – Journal of Biomedical & Clinical Research, **2**(1) Supplement 1, Pleven, 2009, 19-21.
2. **Dimitrov, N., D. Sivrev, Y. Staykova, Z. Goranova.** Comparative analysis of biological active channeles in humans and animals. – Proceedings of Scientific conference with international participation, Stara Zagora, **3**(1), 2008, 351-357.
3. **Duncan, G.** The connective tissue hypothesis for acupuncture mechanisms. – Journal of Chinese Medicine, **93**, 2010, 14-21.
4. **Jiang, X., X. Zhang, Y. Zhen, C. Jiu.** Advances in the study on the role of connective tissue in the mechanical signal transduction of acupuncture. – Acupuncture Research, **34**(2), 2009, 136-139.
5. **Langevin, H., D. Churchill, G. Wu, G. Badger, J. Yandow, J. Fox, M. Krag.** Evidence of connective tissue involvement in acupuncture. – The FASEB Journal, **16**(8), 2002, 872-874.
6. **Langevin, H., D. Churchill, J. Fox, G. Badger, M. Krag.** Biomechanical response to acupuncture needling in humans. – J. Appl. Physiol., **91**(6), 2001, 2471-2478.
7. **Langevin, H., D. Churchill, M. Cipolla.** Mechanical signaling through connective tissue: a mechanism for the therapeutic effect of acupuncture. – The FASEB Journal, **15**(12), 2001, 2275-2282.
8. **Langevin, H., N. Bouffard, G. Badger, D. Churchill, A. Howe.** Subcutaneous tissue fibroblast cytoskeletal remodeling induced by acupuncture: evidence for a mechanotransduction-based mechanism. – J. Cell. Physiol., **207**(3), 2006, 767-774.
9. **Langevin, H., N. Bouffard, G. Badger, D. Churchill.** Connective tissue fibroblast response to acupuncture: Dose-dependent effect of bidirectional needle rotation. – J. Altern. Complement. Med., **13**(3), 2007, 355-360.
10. **Menjo, Y., M. Kobayashi, A. Hayashi, H. Nakayama, K. Kobayashi.** Ultrastructural changes of collagen fibrils in mouse dermal connective tissue after moxibustion treatment. – Journal of Anatomy, **77**(1), 2002, 7-15.
11. **Yu, J., G. Ding, W. Yao, R. Zhan, M. Huang.** The role of collagen fiber in "Zusanli" (ST_{36}) in acupuncture analgesia in the rat. – Chinese acupuncture and moxibustion, **26**(3), 2008, 207-213.

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