

Studies of Kshara, an Ayurvedic medicine (2).¹⁾ Preparation of alternative Kshara Sutra in Japan

Michiyo YOSHIMITSU,^{*a)} Masayuki MIKAGE,^{a)} Yoshimi NAKAGAWA,^{b)} Katsuya YAMAMOTO^{c)} and Kenji TAZAWA^{d)}

^{a)}Graduate School of Natural Science and Technology, Kanazawa University, Kakuma-machi, Kanazawa 920-1192, Japan.

^{b)}Faculty of Pharmaceutical Sciences, Kanazawa University, Kakuma-machi, Kanazawa 920-1192, Japan. ^{c)}Fujikoshi Hospital,

Higashi Ishiganemachi, Toyama 930-0964, Japan. ^{d)}Faculty of Medicine, Toyama Medical and Pharmaceutical University, 2630

Sugitani, Toyama 930-0194, Japan. (Received September 30, 2004. Accepted November 29, 2004.)

Kshara Sutra is a medicated thread which is used in anal fistula surgical operations in Ayurveda, the Indian traditional Medicine. For the purpose of introducing Kshara Sutra therapy into Japan, which offers a better cure rate than modern surgery in India and Sri Lanka, we attempted the production of alternative Kshara Sutra by using Japanese plants and materials. We established the protocol of Kshara Sutra preparation including the use of the latex of the fig (*Ficus carica* L.) fruit as a binding agent instead of Snuhi (*Euphorbia antiquorum* L. or *Euphorbia neliifolia* L.), and red pepper tincture for induction of healing by granulation. In addition, we made Kshara, an alkali agent, from the plant of *Achyranthes bidentata* Bl. and used commercial turmeric powder and a suture with high water absorbency. This was the first Kshara Sutra in use in Japan and we named it "Kanazawa Sutra I". and Its clinical examination is under way.

Key words Kshara Sutra, fistula, Snuhi, latex, *Ficus carica* L., Capsicum Tincture.

Introduction

Kshara Sutra is the thread for the operation for anal fistula. Kshara is an alkali medicine prepared from the ash of Ayurvedic crude drugs, and is widely applied both internally and externally.²⁾ Kshara Sutra is prepared by coating with Kshara made from the whole plant of Apamarga, and with the powder of rhizome of Haridra together with the sticky latex of Snuhi;³⁾ Apamarga is *Achyranthes aspera* L. of the family Amaranthaceae, Haridra is *Curcuma longa* L. of Zingiberaceae, and Snuhi is *Euphorbia neriifolia* L.^{4,5)} and *Euphorbia antiquorum* L.⁴⁾ of Euphorbiaceae.

Operations with Kshara Sutra have already been conducted in Japan.⁶⁾ It was reported that those operations, compared with conventional ones, had many such as advantages easier manipulation in operations, a lower relapse rate, fewer number of days in hospital and less pain for the patients. Kshara Sutra used in those operations in Japan has been imported privately from India and Sri Lanka. Even in those countries, however, Kshara Sutra has not been mass-produced and it is difficult to insure a supply of Kshara Sutra.

We have attempted production of an alternative Kshara Sutra in Japan and succeeded in producing domestic Kshara made from *Achyranthes bidentata* Bl. growing wild in Japan, which has almost the same chemical quality of that produced in Sri Lanka.¹⁾ Beside Kshara, Haridra and turmeric powder are commercially available in Japan, and for the Sutra, we used porous sutures. However, Snuhi which originated in the tropical zone, does not grow in Japan. In this study, we produced the first alternative Kshara Sutra by

using Red pepper tincture and the latex of the fig (*Ficus carica* L.) instead of Snuhi latex. We named it Kanazawa Sutra I.

Materials and Methods

Materials. Kshara-Kshara was prepared from the whole plant of *Achyranthes bidentata* Bl. of the family Amaranthaceae grown on Kanazawa University Takara-machi campus, Kanazawa.¹⁾

The latex of the fig-The fig tree (*Ficus carica* L. of the family Moraceae) was grown in a home garden at Hisayasu, Kanazawa, and we harvested immature fruit just before the experiment in August 2002. The fruit was taken off at the peduncle and bleeding latex was collected through the opening.

Red pepper tincture-Red pepper tincture (Capsicum Tincture, JP14) was a product of Merck Pharmaceutical and was diluted to 10% concentration with distilled water.

Turmeric powder-Turmeric (*Curcuma longa* L., Japanese Herbal Medicines Codex 1989) powder was purchased from Takasago Pharmaceutical Company Ltd., Osaka.

Suture-Experimental sutures with high water absorbency, approximately 0.4 mm in thickness and 0.0018 g/cm, were produced at Kanebo, Ltd.

Instruments. Alkalinity was measured with a pH meter (HORIBA, B-211pH).

Protocol of Kshara sutra preparation. Sutures were stretched over a wooden frame (46cm by 32cm) and sprayed with 10% red pepper tincture solution using a sprayer. Then, the sutures were carefully coated with fig latex individually by using fingers and were adhered with Kshara and

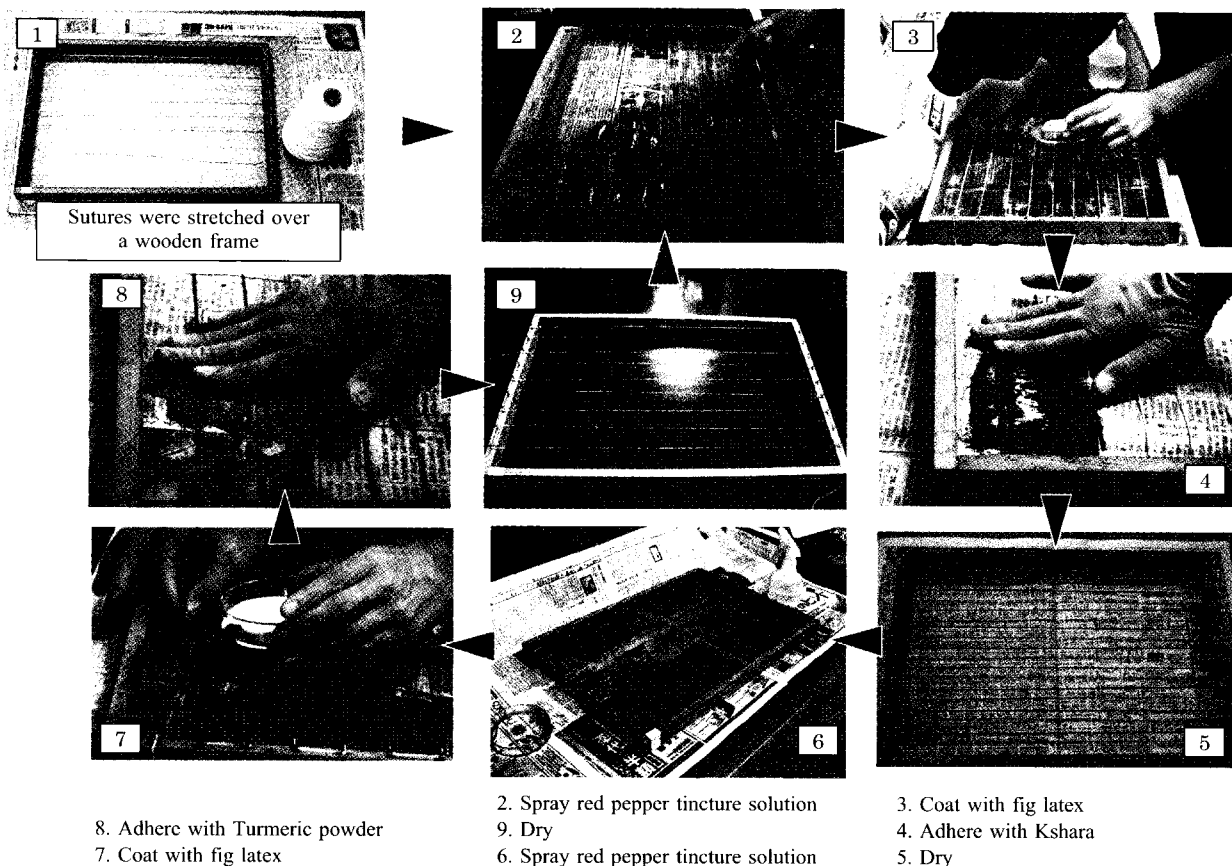
*To whom correspondence should be addressed. e-mail : yoshimi@mail.p.kanazawa-u.ac.jp

dried indoors. Once again the sutures were coated with the red pepper tincture solution and fig latex in the same manner as mentioned previously. Then, turmeric powder was also used for coating and the sutures were dried. This coating process was conducted once or twice. The standard procedure of one cycle is as follows (Scheme 1).

Results

Development of an alternative to Snuhi

The main effects of Snuhi latex in Kshara Sutra are reported as an accelerator of blood circulation and regeneration of granulation tissue of affected parts by its inflammatory reaction.⁷⁾ It also helps adhesion of Kshara and Haridra



Scheme 1 Procedure of preparation of Kanazawa Sutra I

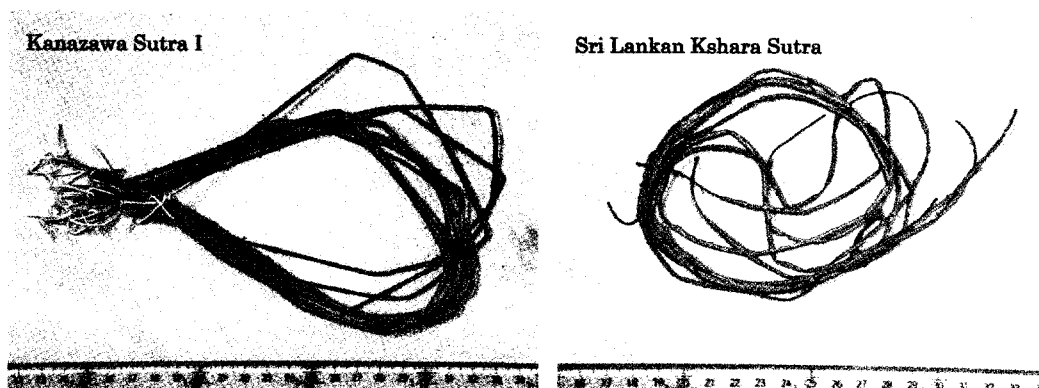


Fig. 1 Kanazawa Sutra I and Sri Lankan Kshara Sutra

to the suture. Some plants in the families of Euphorbiaceae, Moraceae, Compositae, Asclepiadaceae, Papaveraceae, Campanulaceae and Apocynaceae secrete latex. In those families, plants in Euphorbiaceae, Papaveraceae, Apocynaceae and Asclepiadaceae are often poisonous, and secretion of those in Compositae and Campanulaceae is not large. We therefore, chose the fig, *Ficus carica* L. in Moraceae, which grows commonly in Japan and secretes a large volume of latex. The leaves of the fig have been used as a folk remedy for the treatment of hemorrhoids and the latex is known to include ficin, a protease. Since fig latex lacks inflammatory activity, we added red pepper tincture (Capsicum Tincture in JP 14.⁸⁾) for that purpose.

Properties of the sutures produced in this study

Thickness and amount of medicinal agents: Sutures coated with the medicines in one process were 0.97~1.03 mm in thickness. Those in two processes were 1.13~1.40 mm in thickness. The amounts of the coated medicines were 0.005~0.0047 g/cm in one process and 0.0062~0.0070 g/cm in two processes.

Alkalinity: Three cm suture was soaked in a 2 ml saline solution at 5°C and 37°C, and pH of the solution was measured. The pH of the solution incubated at 5°C reached near 9 in 8 hours, and was maintained for the next 48 hours. At 37°C, the pH reached near 9 at five hours, and gradually dropped to near 7 at 24 hours (Fig. 2).

Conclusions and Discussion

1. The use of Kshara prepared from *Achyranthes bidentata* Bl., the latex of immature fig (*Ficus carica* L.) fruit, red pepper tincture (Capsicum Tincture, JP14) and the turmeric (*Curcuma longa* L.) powder enables us to produce alternative Kshara Sutra in Japan. We named it Kanazawa Sutra I.

2. We substituted the latex of Snuhi for the immature fig fruit latex to produce Kanazawa Sutra I. It is assumed that the role of Snuhi is to aid in the stimulation of granulation of the affected parts. On the other hand, many of the plants in the genus *Euphorbia* are known to be poisonous and inflammatory on affected parts, and at the same time, are carcinogenic.⁹⁾ The fig tree, whose matured fruit is edible, secretes latex containing gum and protein, and is presumed to be safer than *Euphorbia* plants. Snuhi works also as a binding agent. The latex of fig is, too, sticky enough. The latex contains ficin that was expected to disinfect affected parts. However, the optimum pH value for ficin activity is near neutral (6.4) and it is assumed to hardly work under alkaline conditions. A problem for using the latex of fig is reduction of viscosity during storage.

3. Since the fig latex is not inflammatory, we added red pepper tincture in this study. It is said that the inflammatory constituent in Snuhi is ingol esters.⁹⁾ Since capsaicin, the main constituent of red pepper tincture, is one of these ingol esters,¹⁰⁾ we expected similar inflammatory reactions. Sores on the affected parts were found when patients had operations in a conventional way of using Kshara Sutra. They may be caused by alkalinity of Kshara or inflammatory

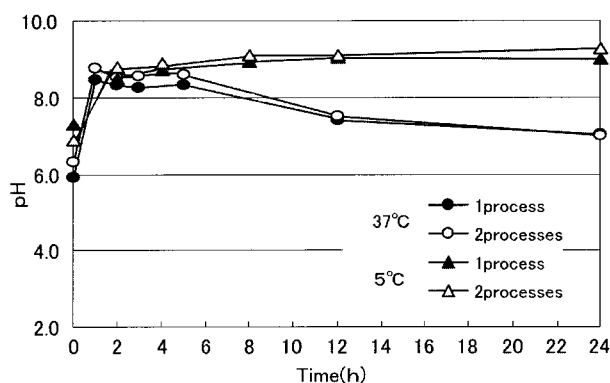


Fig. 2 pH transition of Kanazawa Sutra I in Saline Solution

reaction of Snuhi, which is unknown at the present time.

4. Although the alkalinity of Kanazawa Sutra I was maintained at almost the same value as the Kshara produced in Sri Lanka in saline solution at 5°C, that at 37°C decreased after five hours. On the other hand, the Kshara Sutra produced in Sri Lanka did not show the decreasing of alkalinity at 37°C in saline solution.¹¹⁾ In the preliminary experiment, when Kshara and turmeric powder were mixed in different ratios, the alkalinity of the solution decreased depending on the increase of the turmeric/Kshara ratio. Decrease of alkalinity was presumed to be attributed to the gradual exudation of turmeric which contains acidic compounds, curcumin and its derivatives, as the major constituents. We assume that the quality of turmeric powder, which is determined by curcumin content, affects the maintenance of the alkali level of Kshara Sutra.

5. In 1993, we investigated methods of Kshara Sutra production in Sri Lanka. The suture used in Sri Lanka was 0.5 mm in thickness, and was repeatedly coated with three medicinal agents, Kshara, Snuhi, and Haridra in a day, and the coating process was repeated for 7 days. The suture finally became 1.10 mm in thickness. We used a suture of almost the same as Sri Lanka in thickness, and we made the Kshara Sutra as thick as that produced in Sri Lanka by applying four medicinal agents one or two times; Kshara produced from *Achyranthes bidentata* Bl., turmeric powder, red pepper tincture and the latex of fig. The number of applications and the difference in quality of Kshara Sutra in both countries are still to be analyzed.

6. So far, the operations using Kanazawa Sutra I have been performed 17 times. The result was as follows: the number of times of changing sutures was 3.12 on the average, the average number of days for open wound treatment was 22.59 days, the average number of days in hospital was 19.18 days and the average healing period was 7.59 weeks. Taking 22.59 days for an open wound is longer than the conventional way, 14.5 days. No bad effects were recognized in the process of healing, without slow cut.¹²⁾ Recently, a report claimed that there is no correlation between the alkalinity and the incision strength of Kshara Sutra.¹³⁾ The removal of affected parts have been reported possible in the treatments by using the suture without any

medicinal agents applied, or just rubber thread in Seton Method.¹⁴⁾ But, our operation results showed that the difference in alkaline level of Kanazawa Suture I and Sri Lankan Kshara Sutra seems to affect the capability of incision.

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Japanese abstract

Kshara Sutra はアールヴェーダで痔瘻の治療に用いられる手術糸である。本研究では、Kshara Sutra による施術を広く日本に導入するため、日本に生育する植物を使って国産 Kshara Sutra の作製を試みた。Kshara Sutra を作製するにあたっては 3 種類の薬剤が必要である。その一種 Snuhi (トウダイグサ科の *Euphorbia antiquorum* L. または *Euphorbia neliifolia* L.) は患部の肉芽形成を促進させ、糸に薬剤を付着させる役割を担うとされる。しかし、Snuhi は熱帯性の植物で日本に自生せず、野外での栽培も困難である。そこで、Snuhi の代わりにクワ科のイチジク (*Ficus carica* L.) の未熟果実から得た乳液とトウガラシチンキ剤を用いて Kshara Sutra を作製した。なお、その他の材料として、我が国に自生するヒナタイノコヅチの全草から製した Kshara, 市販のウコン末、および高吸水性糸を使用した。これは我が国初の国産 Kshara Sutra であり、「金沢糸 1 号」と名付けた。その臨床については現在進行中である。

*〒920-1192 石川県金沢市角間町

金沢大学大学院自然科学研究科生命科学専攻

資源生薬学研究室 吉光見稚代