

Research Article

The most important Iranian medicinal plants effective on intra-abdominal adhesions: A systematic review

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Abstract

Adhesions usually begin to form after surgery and during repair or recovery of intra-abdominal injured sites. The main cause of adhesion formation is lack of balance between formation and destruction of fibrin. Treatments for adhesions consist of surgery, fibrinolytic agents, antibiotics, and nonsteroidal anti-inflammatory drugs that may cause their specific side effects and problems. Any measure that leads to decrease in adhesions and associated complications can be useful. Currently, medicinal plants that are effective to heal wounds, reduce inflammation, and boost the body's immune system are being used to prevent many diseases. It is therefore essential to identify effective medicinal plants in preventing intra-abdominal adhesions in surgical patients. In the current review, the words *intra-abdominal adhesions*, *healing adhesion*, *medicinal plants*, *extract*, *essence*, and *Iran* were used to search for and retrieve relevant publications from the scientific databases such as Google Scholar, Scientific Information Database and Scopus. Eligible articles were selected and then examined. According to the results, four plants, *Camellia sinensis*, *Silybum marianum*, *Satureja khuzestanica*, and *Rosa damascena*, were found to have preventative effects against intra-abdominal adhesions. Catechin, epicatechin, epicatechin gallate, epigallocatechin, epigallocatechin gallate, silybin, isosilybin, silychristin, silydianin, taxifolin, thymol, carvacrol, carboxylic acid, flavonoid and polyphenolic compounds, and vitamin C were reported to have anti-inflammatory, antibacterial, and antioxidant properties. It is likely that *C. sinensis*, *S. marianum*, *S. khuzestanica*, and *R. damascena* help reduce intra-abdominal adhesions due to antioxidant compounds through reported action mechanisms in the peritoneum.

Key words: Surgery, Inflammation, Intra-abdominal adhesion, Medicinal plants, Iran

INTRODUCTION

Adhesions usually begin to form after surgery and during repair or recovery (1). Certain biomechanical factors such as inflammation, angiogenesis, and tissue repair cause adhesion formation (2). Infection, foreign bodies, and peritoneal ischemia cause local inflammatory reaction, secretion and deposition of fibrin in the site, and finally the formation of adhesion through

damaging the parietal or visceral peritoneum (3). Studies indicated that damage to the peritoneal surface and ischemic lesions play significant role in formation of intra-abdominal adhesions (4). The main cause of adhesion formation is lack of balance between formation and destruction of fibrin (5). Chronic abdominal and pelvic pain, infertility, obstruction of the small intestine, and

problems in performing other surgeries are some of the complications of intra-abdominal adhesions (6). Treatments for adhesions consist of surgery, fibrinolytic agents, antibiotics, and nonsteroidal anti-inflammatory drugs that may cause their specific side effects and problems. Heparin, promethazine, glucocorticoids, anti-histamines, prostaglandins, Ringer's lactate solution, and calcium channel blockers may also be used to prevent intra-abdominal adhesions (7,8). Any measure that leads to decrease in adhesions and associated complications can be useful. Medicinal plants are nowadays considered as alternative agents in the treatment of various diseases (9-12). Currently, medicinal plants that are effective to heal wounds, reduce inflammation, and boost the body's immune system are being used to prevent many diseases. (13-21). although these plants may have side effects, but in comparison to

conventional drugs they usually have low toxicities (23-31). It is therefore essential to identify effective medicinal plants in preventing intra-abdominal adhesions in surgical patients.

MATERIALS AND METHODS

In the current review, the words *intra-abdominal adhesions*, *healing adhesion*, *medicinal plants*, *extract*, *essence*, and *Iran* were used to search for and retrieve relevant publications from the scientific databases such as Google Scholar, Scientific Information Database and Scopus. Eligible articles were selected and then examined.

RESULTS

According to the results, four plants, *Camellia sinensis*, *Silybum mariumum*, *Satureja khuzestanica*, and *Rosa damascena*, were found to cause prevention of intra-abdominal adhesions (Table 1).

Table 1. Medicinal plants with preventative effects against intra-abdominal adhesion.

| Botanical name | Family name | Persian name | Main findings |
|-----------------------------|-------------|-------------------|--|
| <i>Camellia Sinensis</i> | Theaceae | Chaye sabz | An experimental study on male Wistar rats demonstrated that treatment with 4 ml of ethanolic <i>C. sinensis</i> extract, alongside normal saline, caused significant decrease in intra-abdominal adhesions after 14 days. In this study, Linsky scale that is a 4-point scale was used to determine the degrees of the adhesions and treatment due to the extract. The results demonstrated that in the treatment group, degree 3 adhesions (40%) were the most frequent adhesions, and in the control group, degree 6 adhesions (20%) were the most frequent adhesions. Altogether, the median of adhesion degree was 3 in the treatment group and 8 in the control group. This study demonstrated that <i>C. sinensis</i> extract caused significant decrease in the intra-abdominal adhesions (32). |
| <i>Silybum mariumum</i> | Asteraceae | Khaar maryam | An experimental study on rats demonstrated that hydroalcoholic <i>S. mariumum</i> , in 1% and 5% doses, caused significant decrease in intra-abdominal adhesions. According to the findings, the frequency of degree 0 adhesions (without adhesion) was 3 in the experimental group and <i>S. mariumum</i> -treated group, while in the control group, all rats had adhesion bands that spread into intra-abdominal parts. In addition, in groups treated with 1% and 5% extracts, degree 1 adhesions (50%) were the most frequent adhesions, and in the control group, degree 2 adhesions (50%) were the most frequent adhesions. This study demonstrated that <i>S. mariumum</i> extract caused significant decrease in the intra-abdominal adhesions (33). |
| <i>SaturejaKhuzestanica</i> | Lamiaceae | Marzeh khuzistani | An experimental study with rat model demonstrated that simultaneous administration of 250 mg/kg of <i>S. khuzestanica</i> and 250 mg/kg <i>S. khuzestanica</i> + vitamin C caused significant decrease in the intra-abdominal adhesions. This study reported that there were significant differences in fibrosis, inflammation, and vascular proliferation between the control group and the treatment groups. The highest fibrosis and the lowest inflammation and vascular proliferation were seen in the control group. According to the results, the control, vitamin C, and <i>S. khuzestanica</i> groups had adhesion rates of 10%, 60%, and 10%, respectively. <i>S. khuzestanica</i> and vitamin C combination effectively reduced the intra-abdominal adhesions (34). |
| <i>Rosa damascena</i> | Rosaceae | Gole mohammadi | A study on rats demonstrated that 14-day treatment with 3 ml of <i>R. damascena</i> extract, in 1% and 5% doses, caused significant decrease in intra-abdominal adhesions following laparotomy (35). |

DISCUSSION

Intra-abdominal adhesion is one of the problems that occur after open surgeries such as intestinal

surgeries, gynecological surgeries, cesarean section, ovariectomy, and uterine diseases. The use of medicinal plants is a useful approach with comparatively fewer side effects. This review demonstrated that *C. sinensis*, *S. mariamum*, *S. khuzestanica*, and *R. damascena* have preventative effects against intra-abdominal adhesions (36). *C. sinensis* was reported to have antioxidant, anti-inflammatory, and antibacterial effects (37-39). A phytochemical study demonstrated that *C. sinensis* contains the active polyphenolic compounds catechin, epicatechin, epicatechin gallate, epigallocatechin, and epigallocatechin gallate (40). *S. mariamum* exerts hepatoprotective, anticancer, anti-inflammatory, and antioxidant effects. According to phytochemical studies, *S. mariamum* contains silybin, silychristin, silydianin, and taxifolin (41,42).

In Iranian traditional medicine, *S. khuzestanica* has been reported to have hypolipidemic, antibacterial, anti-inflammatory, and antioxidant effects (43,44). Phytochemical investigations indicated that *S. khuzestanica* contains thymol and carvacrol (45,46). *R. damascena* has been reported to exert effect on free radicals and inflammatory cells, exert anticancer effects, prevent gene mutations, and has antioxidant properties (47,48). *R. damascena* is a rich source of carboxylic acid, flavonoid and polyphenolic compounds, and vitamin C (49,50). Antioxidants cause reduction in intra-abdominal adhesions via certain mechanisms such as free radicals-induced decrease in oxidative stress, fibrinolytic property, and reducing oxidative stress and oxidative compounds (51,52). Antioxidant activity in plants is an important factor not only in abdominal adhesion, but also in relieve of other complications (53-64). It is likely that *C. sinensis*, *S. mariamum*, *S. khuzestanica*, and *R. damascena* help reduce intra-abdominal adhesions due to antioxidant compounds through above action mechanisms in the peritoneum. Intra-abdominal adhesions have many causes. For example, infection can cause adhesion and fallopian tube obstruction. It can be argued that the antioxidant compounds of *C. sinensis*, *S.*

mariamum, *S. khuzestanica*, and *R. damascena* can reduce intra-abdominal adhesions through removing infection in the peritoneum. Furthermore, microorganisms can cause infection or can alter immune system by various mechanisms (63-73). Therefore, medicinal plants which have several compounds with antimicrobial activity might be useful for prevention and treatment of these infections.

Catechin, epicatechin, epicatechin gallate, epigallocatechin, epigallocatechin gallate, silybin, isosilybin, silychristin, silydianin, taxifolin, thymol, carvacrol, carboxylic acid, flavonoid and polyphenolic compounds, and vitamin C were reported to have anti-inflammatory, antibacterial, and antioxidant properties. It is therefore likely that *C. sinensis*, *S. mariamum*, *S. khuzestanica*, and *R. damascena* cause reduction in intra-abdominal adhesions due to such antioxidant compounds through above action mechanisms in the peritoneum. Although the mechanism actions of these plants are not clear, but it is obvious that oxidative stress is an important component of abdominal adhesion. Hence, medicinal plants which have antioxidant activity (74-83) should be effective in this problem with reducing inflammation and speed up wound healing. These plants are a good source for preparation of new drugs, too (84-89). These plants mostly have phenolic compounds which usually have antimicrobial activities, other than antioxidant properties that all can prevent to adhesion formation (90-104).

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