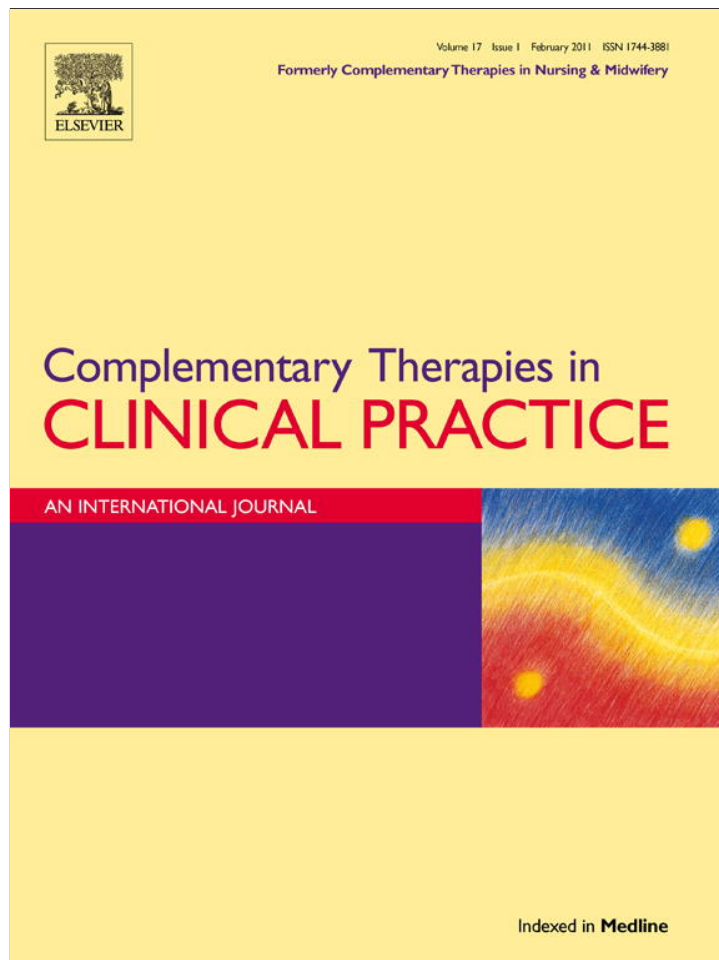


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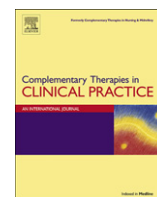
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Complementary Therapies in Clinical Practice

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Healing advantages of lavender essential oil during episiotomy recovery: A clinical trial

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A B S T R A C T

Keywords:

Lavender
Povidone-iodine
Episiotomy
Postpartum care

Episiotomy is the most common perineal incision in obstetric and midwifery. Nowadays alternative and complementary methods such as Aromatherapy using essential oils are established as an alternative therapy. This research was carried out to assess the effect of lavender oil in wound healing. This randomized control trial was conducted on 120 primiparous women with singleton pregnancy, without any acute and chronic disease and allergy who had undergone normal spontaneous vaginal delivery and episiotomy. They were randomly allocated in case and control groups. Case group received lavender oil and controls received Povidone-iodine. Incision sites were assessed on the 10th day postpartum. 25 out of 60 women in lavender group and 17 mothers in control group had no pain ($p = 0.06$). There was no significant difference between two groups in surgery site complications. However, redness in lavender group was significantly less than controls ($p < 0.001$). This study suggests application of lavender essential oil instead of Povidone-iodine for episiotomy wound care.

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1. Introduction

Episiotomy is the most common perineal incision in obstetrics and midwifery. It was first used in normal deliveries in 1742.¹ Episiotomy is commonly performed in USA to prevent obstetric perineal lacerations.² Studies suggest that using episiotomy in normal delivery results in fewer perineal laceration and trauma.³ Wound healing is complex and requires safe and effective treatment modalities. Attention should be afforded to episiotomy wound care since it parallels any other wound. One of the suggested methods is a regular antiseptic sitz bath.⁴

No Povidone-iodine is an antiseptic that is widely used in Iran for surgical and skin wounds.⁵ All midwives and obstetricians apply betadine for postpartum care. To date no study about betadine and its side effects in Iran. In a study that compared the effectiveness of betadine and water no significant difference was found between the two groups in wound healing.⁶ Various studies have provided evidence that povidone-iodine does not promote wound healing, and even impair wound healing, reduce wound strength or cause skin reactions. Cooper et al. showed that povidone-iodine with a dose dependent manner can suppress function of fibroblasts and lymphocytes.⁷ Nowadays, using alternative and complementary

therapies such as essential oils in aromatherapy have been recognised in obstetrics. Aromatherapy used healing effects of volatile essential oils on the body in different ways.⁸ Pharmacological impacts of each essential oil differ regarding to their chemical composition, principal constituents, country of origin and method of extraction. Mechanisms of action of each essential oil is related to its complex active substances. One of the means of action is the aroma of these oils sent as a signal to the olfactory bulb which has close anatomical ties to the limbic system. The limbic system is the emotional center of the brain, where all major emotional expressions are generated. The limbic system influences the endocrine and the autonomic nervous. Another mechanism is absorption through the skin. The molecules of essential oils and carrier oils are small enough to permeate through the skin barrier. Skin absorption can be via massage, bath, foot bath and hot or cold compresses. The molecules will be absorbed easily into the skin within 20–40 min depending on the chemical nature of the oil.⁹ *Lavandula stoechas* (*Lamiaceae*) or Lavender is one of the plants with aromatic leaves and attractive bracts at the top of flowers. It grows in western Mediterranean countries, the Atlantic islands, Turkey, Pakistan and India.¹⁰

The flowers, and the essential oil derived from them are anti-bacterial, antifungal, sedative, anti-depressive and effective for burns and insect bites.¹¹ Lavender has carminative (smooth muscle relaxing), anti-flatulence and anti-colic properties in aromatherapy.¹² In traditional medicine, *L. stoechas* has been used as

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carminative and antispasmodic for a long time.¹³ Lavender inhibits potassium induced contractions in a dose dependent manner like channel blockers such as Verapamil.¹⁴

Alpha-terpineol and terpinen-4-ol and camphor are the chemical constituents of Lavender essential oil that have antibacterial effects. Alpha-pinene, beta-pinene and p-cymene are other substances that have antifungal activity.^{12,15} Carvacrol, terpinen-4-ol, linalool, sabinene, α -terpinene, and γ -terpinene which are in *Lavandula Stoechas* are effective in some Gram-negative and Gram-positive bacteria and three pathogenic fungi.^{14,16} β -pinene (39.7%), α -pinene (10.9%) and camphor (9.7%) were the main components of *Salvia tomentosa* (Miller) oil which are antioxidant and antimicrobial.¹⁷ Antibacterial activity of P-cymene, cryptone or thymol has been suggested as the most potent inhibitor of *Pseudomonas aeruginosa* growth.¹⁸

The use of lavender oil for perineal healing was first investigated by Dale and Cornwell in 1994 and has not been replicated to date.^{19,20} They conducted a clinical trial on 635 women using lavender oil and placebo following normal vaginal delivery for perineal healing. In this study mean discomfort score was lower in women using lavender oil,^{19,20} with no significant side effects reported.

This study aims to assess the effects of *Lavandula* on episiotomy healing.

2. Materials and methods

2.1. Preparing lavender essential oil

Lavender essential oil was extracted from fresh flowers and inflorescences using TKF500 apparatus. The flowers were collected just before blooming. After transition to TKF500 apparatus, a distillation method was applied. Subsequently, sodium sulfate was added to essence of lavender to extract water and finally, 1.5% lavender essential oil was prepared in olive oil as carrier after 2 h.

This clinical trial was conducted by Barij Essence Pharmaceutical Co. 120 subjects were included in the study using a convenience sample. Written informed consent was signed by all the individuals. Primiparous women with singleton pregnancy and those without any acute and chronic disease or allergy with spontaneous vaginal delivery who had undergone episiotomy were included in the study.

As there are no Lamaze classes or perineal massage programs during pregnancy in Iran, almost all primiparous women undergo episiotomy. In Iran episiotomy occurs routinely for primiparous women; however, but in multiparous women, episiotomy is physician decision based on medical indications. Most episiotomies are medio-lateral and mid-line episiotomy is performed only rarely.

As episiotomy is routine in primiparous women with spontaneous vaginal delivery, these cases were included in the study. All episiotomies were medio-lateral.

Participants were allocated based using computerized block randomization into two groups of Povidone-iodine as a control group, with the lavender essential oil as the treatment group (60 subjects in each arm). Controls and cases received povidone-iodine and essential Lavender oil, respectively. A sitz bath using 5–7 drops of essential Lavender oil in 4 L of water, twice a day for 10 days was used in the case group while in control group routine postnatal care using povidone-iodine was suggested.

Two groups were asked to refer to Taleghani clinic for evaluating healing in episiotomy line on the 10th day postpartum. Individuals who did not attend for examination or presented any sign of allergy were excluded. Each woman recruited was given a green card Labeled "A" or "B", indicating control and case group, respectively. Blind examination was performed by a midwife taught how to evaluate episiotomy. Six criteria were evaluated in a checklist. There included pain level, edema, redness, dehiscence, number of sutures and infection. Reliability was done by test re test with

$r = 0.8$. Pain was assessed by means of a visual analog scale (VAS). Edema and redness were each evaluated and reported in centimeters and millimeters, respectively. Data analysis was done by SPSS software version 15.00 for Windows using T-Test and χ^2 . The significance level was set at 0.05 ($\alpha = 0.05$). The study protocol was approved by local medical research ethics committee.

3. Results

Demographic findings showed that the most of the women were housekeepers; 95% (57) in the treatment group vs. 96.7% (58) in control group ($p = 0.614$), who were educated to diploma level 45.8 (27 cases) vs. 35.2% (19 controls). This was not significantly different between the two groups ($p = 0.120$). Table 1 shows that there was no significant difference between the two groups in terms of mean age, duration of first and second stage of labor, number of pregnancy and weight of newborns.

Table 1
Comparison of Demographic data between case and control groups.

| Variables (Mean \pm SD) | Povidone-iodine group (n = 60) | | Lavender group (n = 60) | | P value |
|-----------------------------|--------------------------------|------|-------------------------|------|---------|
| Age | 23.59 \pm 3.5 | | 24.5 \pm 3.72 | | 0.782 |
| Number of pregnancy | 1.33 \pm 0.5 | | 1.32 \pm 0.55 | | 0.908 |
| first phase of labor (hour) | 5.3 \pm 2.75 | | 4.5 \pm 1.92 | | 0.112 |
| second phase of labor (min) | 27.1 \pm 17.5 | | 27.97 \pm 16.32 | | 0.811 |
| Weight of newborn (gr) | 3098.91 \pm 475.8 | | 3207.2 \pm 637.61 | | 0.763 |
| Education | number | % | number | % | P value |
| Primary school | 16 | 29.6 | 11 | 18.6 | 0.120 |
| Guidance school | 10 | 18.5 | 16 | 27.1 | |
| High school | 6 | 11.1 | 1 | 1.7 | |
| Diploma | 19 | 35.2 | 27 | 45.8 | |
| College education | 3 | 5.6 | 4 | 6.8 | |
| Job | | | | | |
| Housekeeper | 96.7 | 58 | 57 | 98.3 | 0.614 |
| others | 3.3 | 2 | 1 | 1.7 | |

As shown in Table 2, 25 individuals in the lavender group and 17 of the control group had no pain at all which was not significantly different between the groups. Thirty-one individuals (51.7%) in the lavender group and 13 individuals (21.7%) in the control group had

Table 2
Comparison of episiotomy healing evaluation in case and control groups.

| Variables | Povidone-iodine group | | Lavender group | | P value |
|----------------------|-----------------------|------|----------------|------|-------------|
| | number | % | number | % | |
| Pain | | | | | |
| No pain | 17 | 28.3 | 25 | 41.7 | $p = 0.063$ |
| Moderate | 25 | 41.7 | 27 | 45 | |
| Sever | 18 | 30 | 8 | 13.3 | |
| Edema | | | | | |
| No | 36 | 60 | 30 | 50 | $p = 0.320$ |
| 1–2(cm) | 19 | 15 | 16 | 26.7 | |
| 2> | 7 | 1.7 | 0 | 0 | |
| Leaved suture | | | | | |
| No | 27 | 45 | 24 | 40 | $P = 0.62$ |
| 1–3 | 18 | 30 | 16 | 26.7 | |
| 4–6 | 15 | 25 | 20 | 33.3 | |
| Redness | | | | | |
| No | 13 | 21.7 | 31 | 51.7 | $P = 0.001$ |
| 1–3 | 8 | 13.3 | 6 | 10 | |
| 4–7 | 11 | 18.3 | 15 | 25 | |
| 7> | 28 | 46.7 | 8 | 13.3 | |
| Dehiscence | | | | | |
| Yes | 26 | 43.3 | 19 | 31.7 | $p = 0.129$ |
| No | 34 | 56.7 | 41 | 68.3 | |

no redness ($p = 0.001$). Edema more than 2 cm was not observed in the lavender group. No complications were observed except a little irritation in two patients. Three cases and two controls had mild infections that were treated by antibiotics.

4. Discussion

The findings showed that redness in the lavender group was significantly lower than control group.

Inflammation in the lavender group was less than the controls. Görena et al. demonstrated in their study that *Lavandula stoechas* has caryophyllene oxide¹³ which has an anti-inflammatory effect.²¹ The anti-inflammatory effect of lavender in rats was also confirmed by Hajhashemi et al.²² The other study similarly showed that 1,8-Cineole and terpenoid oxide are constituents of many plant essential oils and have an inhibitory effect on some types of inflammation on rats.²³

It seems that lavender has an anti allergic effect on mast cell-mediated immediate-type allergic reactions, and some concentration-dependent inhibition impact on histamine release from the peritoneal mast cells in mice and rats was noted in the Kim et al. study.²⁴

There was no significant difference between the two groups in pain scores in our results.

However, it has been reported that effects of essential oils on limbic system leads to encephalin, endorphin and serotonin release.⁹ Essential oils also contain Linalyl acetate and linalool that can have sedative and local anesthetic effects.^{25–27}

In an analytic study, 8058 mothers were evaluated for labor pain relief. Findings showed that aromatherapy in childbirth would reduce the need for additional analgesia in a proportion of mothers. The use of pethidine in that study declined from 6% to 0.4% of women and only 1% of women experienced side effects.⁸ In another study, a blind randomized clinical trial was designed in 3 groups of postpartum episiotomy care using pure lavender oil, synthetic lavender oil and an inert substance as a bath additive for 10 days. Analysis of daily discomfort scores revealed no statistically significant difference between groups.^{19,24,25} The analgesic effect of lavender oil aromatherapy was assessed after breast biopsy by Kim et al. The group that used supplemental oxygen through a face mask plus two drops of 2% lavender oil showed no significant difference in pain scores in comparison to controls who received only oxygen. However, patients in the lavender group reported higher levels of satisfaction with pain control than patients in the control group ($P = 0.0001$).²⁸

Infection and dehiscence incidence in our results showed no significant difference between two groups. Three individual in case group and two of controls presented mild infection who were treated by antibiotic. Essential oils containing terpene alcohols have antibacterial effect.²⁹ Antimicrobial activity of cineole, citral, geraniol, linalool and menthol has been confirmed.³⁰ Other constituents of lavender with antibacterial effects are alpha-terpineol, terpenen-4-ol, and camphor.^{31–33} Carvacrol, terpinen-4-ol, linalool, sabinene, α -terpinene, and γ -terpinene were tested against six Gram-negative and Gram-positive bacteria and three pathogenic fungi in Aliagiannis et al. study. They showed a good antimicrobial effects against the pathogens mentioned.¹⁶ Linalool and α -terpineol were active against all organisms except *Pseudomonas aeruginosa*.³⁴

In our study, the number of remaining sutures noted was not significant between two groups.

5. Conclusion

It seems that Lavender can be used as a suitable therapy for postpartum episiotomy wound care. We did not face any side effects except in two patients who had a little irritation.

Future randomized clinical trials with large sample size and careful follow-up with close observation is suggested for more confirmation of our results.

Conflict of interest

The authors have no conflict of interest to declare.

Funding source

No funding source.

Acknowledgement

Our sincere thanks to Research Management of Arak University of Medical Sciences for allocating financial resources. We also offer thanks to all the patients who help us conducting this research. The authors wish to send their sincere gratitude to Farzan Institute for Research and Technology for technical assistance.

References

1. Thorp Jr JM, Bowes Jr WA. Episiotomy: can its routine use be defended? *American Journal of Obstetrics and Gynecology* 1989;**160**:1027–30.
2. Cunningham FG, Leveno KJ, Bloom SL, et al. *Williams obstetrics*. 22nd ed. MC Graw Hill; 2005. 435.
3. Woolley RJ. Benefits and risks of episiotomy: a review of the English-language literature since 1980. Part II. *Obstetrics and Gynecology Survey* 1995;**50**:821–35.
4. Lowdermilk DL, Perry SHE. *Maternity & women's Health care*. 8th ed. Mosby Inc; 2003.
5. Tavakoli R, Nabipour F, Najafipour H. Effect of betadine on wound healing in rat. *Journal of Babol University of Medical Sciences (Jbums)* 2006;**8**:7–12.
6. Zahrani Sh, Amirali Akbari S, Valaei N. Comparison of the effect of betadine and water in episiotomy. Wound healing. *Fez* 2002;**5**:80–5.
7. Cooper ML, Laxer JA, Hansbrough JF. The cytotoxic effects of commonly used topical antimicrobial agents on human fibroblasts and keratinocytes. *Journal of Trauma* 1991;**31**:775–82.
8. Burns E, Blamey C, Ersser SJ, Lloyd AJ, Barnetson L. The use of aromatherapy in intrapartum midwifery practice an observational study. *Complementary Therapies in Nursing and Midwifery* 2000;**6**:33–4.
9. Habanananda T. Non pharmacological pain relief in labour. *Journal of Medical Association of Thailand* 2004;**87**:194–202.
10. Staicov V, Chingova B, Kalaidjiev I. Studies on several lavender varieties. *Soap, Perfumery & Cosmetics* 1969;**42**:883–7.
11. Cavanagh HM, Wilkinson JM. Biological activities of lavender essential oil. *Phytotherapy Research* 2002;**16**:301–8.
12. Lis-Balchin M, Hart S. Studies on the mode of action of the essential oil of lavender (*Lavandula angustifolia* P. Miller). *Phytotherapy Research* 1999;**13**:540–2.
13. Görena AC, Topcu G, Bilsel G, Bilsel M, Aydogmus Z, Pezzuto JM. The chemical constituents and biological activity of essential oil of *lavandula stoechas* ssp. *stoechas*. *Z Naturforsch* 2002;**57c**:797–800.
14. Adam K, Sivropoulou A, Kokkini S, Lanaras T, Arsenakis M. Ethnopharmacological evaluation of the anticonvulsant, sedative and antispasmodic activities of *Lavandula stoechas* L. *Journal of Ethnopharmacology* 2000;**71**:161–7.
15. Gilani AH, Aziz N, Khan MA, Shaheen F, Jabeen Q, Siddiqui BS, et al. Antifungal activities of *Origanum vulgare* subsp. *hirtum*, *Mentha spicata*, *Lavandula angustifolia*, and *Salvia fruticosa* essential oils against human pathogenic fungi. *Journal of Agriculture & Food Chemistry* 1998;**46**:1739–45.
16. Aliagiannis N, Kalpoutzakis E, Mitaku S, Chinou IB. Composition and antimicrobial activity of the essential oils of two *Origanum* species. *Journal of Agriculture & Food Chemistry* 2001;**49**:4168–70.
17. Tepe B, Daferera D, Sokmen A, Sokmen M, Polissiou M. Antimicrobial and antioxidant activities of the essential oil and various extracts of *Salvia tomentosa* Miller (Lamiaceae). *Food Chemistry* 2005;**90**:333–40.
18. Cimanga K, Kambu K, Tona L, Apers S, De Bruyne T, Hermans N, et al. Correlation between chemical composition and antibacterial activity of essential oils of some aromatic medicinal plants growing in the Democratic Republic of Congo. *Journal of Ethnopharmacology* 2002;**79**:213–20.
19. Dale A, Cornwell S. The role of lavender oil in relieving perineal discomfort following childbirth: a blind randomized clinical trial. *Journal of Advance Nursing* 1994;**19**:89–96.
20. Cornwell S, Dale A. Lavender oil and perineal repair. *Modern Midwifery* 1995;**5**:31–3.
21. Shimizu M, Shogawa H, Matsuzawa T, Yonezawa S, Hayashi T, Arisawa M, et al. Anti-inflammatory constituents of typically applied crude drugs. IV. Constituents and anti-inflammatory effect of Paraguayan crude drug "alhuecema"

- (*Lavandula latifolia* Vill.). *Chemical and Pharmacological Bulletin (Tokyo)* 1990;**38**:2283–4.
22. Hajhashemi V, Ghannadi A, Sharif B. Anti-inflammatory and analgesic properties of the leaf extracts and essential oil of *Lavandula angustifolia* Mill. *Journal of Ethnopharmacology* 2003;**89**:67–71.
 23. Santos FA, Rao VSN. Anti-inflammatory and anti nociceptive effects of 1,8-cineole a terpenoid oxide present in many plant essential oils. *Phytotherapy Research* 2000;**14**:240–4.
 24. Kim HM, Cho SH. Lavender oil inhibits immediate-type allergic reaction in mice and rats. *Journal of Pharmacy and Pharmacology* 1999;**51**:221–6.
 25. Sugawara Y, Hara C, Tamura K, Fujii T, Nakamura K, Masujima T, et al. Sedative effect on humans of inhalation of essential oil of linalool. Sensory evaluation and physiological measurements using optically active linalools. *Analytica Chimica Acta* 1998;**365**:293–9.
 26. Kim JT, Wajda M, Cuff G, Serota D, Schlame M, Axelrod DM, et al. Aromatherapy: evidence for sedative effects of the essential oil of lavender after inhalation. *Z Naturforsch C* 1991;**46**:1067–72.
 27. Ghelardini C, Galeotti N, Salvatore G, Mazzanti G. Local anaesthetic activity of the essential oil of *Lavandula angustifolia*. *Planta Medica* 1999;**65**:700–3.
 28. Buchbauer G, Jirovetz L, Jäger W, Dietrich H, Plank C. Evaluation of aromatherapy in treating postoperative pain: pilot study. *Pain Practice* 2006;**6**:273–7.
 29. Inouye S, Yamaguchi H, Takizawa T. Screening of the antibacterial effects of a variety of essential oils on respiratory tract pathogens, using a modified dilution assay method. *Journal of Infection Chemotherapy* 2001;**7**:251–4.
 30. Pattnaik S, Subramanyam VR, Bapaji M, Kole CR. Antibacterial and anti-fungal activity of aromatic constituents of essential oils. *Microbios* 1997;**89**:39–46.
 31. Pattnaik S, Subramanyam VR, Bapaji M, Kole CR. Activity of lavender essential oil against non-tubercular opportunistic rapid grown mycobacteria. *Pharmacological Research Communications* 1988;**20**(Suppl. 5):37–40.
 32. Gabbrielli G, Loggini F, Cioni PL, Giannaccini B, Mancuso E. In-vitro antimicrobial activity and chemical composition of sardinian thymus essential oils. *Letters in Applied Microbiology* 1999;**29**:130–5.
 33. Jedlickov'a Z, Mottl O, Ser'y V. Antibacterial properties of the Vietnamese cajeput oil and ocimum oil in combination with antibacterial agents. *Journal of Hygiene, Epidemiology, Microbiology and Immunology* 1992;**36**:303–9.
 34. Carson CF, Riley TV. Antimicrobial activity of the major components of the essential oil of *Melaleuca alternifolia*. *Journal of Applied Bacteriology* 1995;**78**:264–9.