

Honey combined with silver ion dressing in complicated chronic wound of the scalp: a case report

J.-O. LIN¹, L.-L. YANG², X. YANG¹, X.-H. ZENG¹, Y. ZHANG¹, Z.-P. LI¹, H.-Y. LIU¹

¹Department of Neurosurgery, ²Department of Nephrology, Mianyang Central Hospital, School of Medicine, University of Electronic Science and Technology of China, Sichuan, P.R. China

Jianqiong Lin and Liling Yang contributed equally to this work

Abstract. – OBJECTIVE: Scalp wound healing is a complex process. Nonhealing wounds can become chronic wounds, which increase the trauma and economic burden on a patient and may even cause death in severe cases. Thus, it can be difficult to find an effective treatment for chronic wounds of the scalp.

CASE PRESENTATION: We present a case of a 13-year-old female patient with a chronic wound caused by a scalp incision infection 3 months after two operations for craniotomy for arachnoid cyst resection and cystic lesion-cisterna magna drainage. After repeated dressing changes and two debridement operations, the incision had still not healed during the following year. The wound finally healed after 6 months of dressing changes by combining honey with silver ion dressings, and the incision had not re-ruptured after 10 months of follow-up.

CONCLUSIONS: Honey combined with silver may be an effective method for the treatment of chronic scalp wounds.

Key Words:

Chronic wound, Scalp, Honey, Silver ion dressing.

Introduction

Incision healing after neurosurgery affects postoperative recovery, the length of a hospital stay, and hospitalization costs. The human scalp contains many hair follicles, sweat glands, and sebaceous glands. Sebaceous glands are highly active in secretion and contain high amounts of protein, which makes them a boarding place for bacteria and can lead to infection. Chronic bacterial infection and rejection reaction are

the main mechanisms of incision nonhealing^{1,2}. Chronic wounds can be formed as a result of persistent nonhealing of scalp incisions. Debridement to remove necrotic tissue and foreign bodies is often performed to accelerate wound cleaning and shorten repair time and is a common method for treating chronic wounds³. However, wound debridement may damage important tissues, and the close connection between foreign bodies and important tissues increases the difficulty of surgery. Therefore, more effective and conservative treatments of chronic wounds are urgently required. Honey has antibacterial, antioxidant, anti-inflammatory, and immunomodulatory properties, and may be suitable for treating chronic wounds⁴. Silver ion dressings also have antibacterial effects and may also have roles in the treatment of chronic wounds⁵.

Therefore, honey and silver ion tandems are potential treatment options for chronic wounds. The use of honey in chronic wounds has been reported, but not in chronic incisions of the scalp⁴. Honey combined with silver ions for the treatment of chronic scalp infections has not been reported. Here, we present a case of a healed incision after neurosurgery, which was followed by a re-rupture that led to a complicated chronic scalp wound. The chronic wound was eventually healed by conservative treatment using honey combined with silver ion dressings.

Case Presentation

Written informed consent was obtained from the parents of the patient for the publication of this case report and the patient's images.

A 13-year-old female patient was admitted to our institute for a headache that had persisted for 6 months. Cranial magnetic resonance imaging (MRI) examination suggested a cystic mass in the pineal region. The pineal cystic lesion was resected by a supracerebellar infratentorial approach, and an artificial *dura* was inserted. Postoperatively, the headache remained, and head computed tomography (CT) showed brain edema, hydrocephalus, and cystic occupancy in the pineal region (Figure 1A-C). The patient underwent placement of a cystic lesion-cisterna magna drainage tube. After surgery, the patient's headache was relieved, and cranial CT showed that the cyst was significantly smaller, and hydrocephalus was significantly reduced (Figure 1D-F). The wound healed well, but purulent fluid from the occipital incision was observed 3 months after the surgery. The patient's body temperature was not elevated, and blood routine examination was normal. There was no improvement in purulent fluid discharge after treating the incision with silver ion dressing, and secretions still flowed after debridement. Furthermore, the wound became larger over the course of subsequent silver ion dressing changes. The skull could be seen, and the scalp incision was ulcerated in three places, with sizes of 3.5 cm, 1.8 cm, and 1.7 cm (Figure 2A). Two of the wounds were interlinked, and the wounds were surrounded by redness and swelling. The temperature of the skin surrounding the wound was high and the bacterial culture revealed the presence of *Staphylococcus aureus*. Bone fragments were removed during a dressing change. Following this, a second incision debridement was performed after repeated failed dressing changes, and cranial CT before the second wound debridement revealed partial occipital defect and no enlargement of the cyst (Figure 1G-I). The wound healed well after debridement. However, 3 days after removal of the stitches, a rupture appeared at the incision site (Figure 2B), and a local cavity was formed under the incision scar, with yellow liquid (without bacterial growth) flowing out. The scalp rupture gradually increased, reaching a maximum area of $2.0 \times 1.0 \times 1.2 \text{ cm}^3$ and the longest subcutaneous cavity measured 3 cm (Figure 2C). The granulation was loose and dark red, and bled easily. Bacterial culture of the wound secretion suggested *Staphylococcus aureus*. The size of the wound and cavity gradually increased during dressing changes. While changing dressing, a flaky white

membrane was detected in the wound, which was considered as chronic wound nonhealing caused by a foreign body reaction to the artificial *dura*. Surgical removal of the artificial *dura* was extremely risky, due to the wound infection and the close connection between the drainage tube and the artificial *dura* (Figure 1G). With the parents' consent and approval from the ethics committee, natural honey was applied directly to improve the local nutritional status of the wound; gauze was laminated with trapezoidal pressure, and postural drainage was performed (Figure 2D). Honey and new silver ion dressing were used alternately. The dressing with honey was used if the wound was nutritionally poor, while dressing with silver ion was used if the wound secretions showed the presence of bacteria. The flesh buds around the wound became firm and ruddy. After 1 year of dressing changes, the artificial cerebral *dura mater* patch was gradually drained, and the wound had healed (Figure 2E). After follow-up for additional 10 months, there was no rupture of the wound and no change to the cyst (Figure 1J-L).

Discussion

If an incision does not heal after neurosurgery, improper treatment may not only cause intracranial infection and bone exposure, but could also increase the patient's trauma, prolong the hospital stay, increase the economic burden, and may even cause death in severe cases. There are many reasons for nonhealing of incisions after neurosurgery, and the presence of an implant is an independent risk factor⁶. Debridement should be performed as soon as possible to remove the implant fully. In this case, the patient's prolonged postoperative wound nonhealing was eventually considered the result of rejection of the artificial *dura*. Surgical debridement to remove foreign bodies is a common method in the treatment of chronic wounds⁷. However, the shunt tube of the pineal cyst in this patient was attached to the artificial *dura mater*. The risk factors for removing the foreign bodies after debridement were as follows: (1) as there were adhesions between the artificial *dura mater* and the cyst shunt, the removal could result in intraoperative bleeding, cerebrospinal fluid leakage, intracranial infection, and even life-threatening infection; (2) removal of the shunt could lead to recurrence of

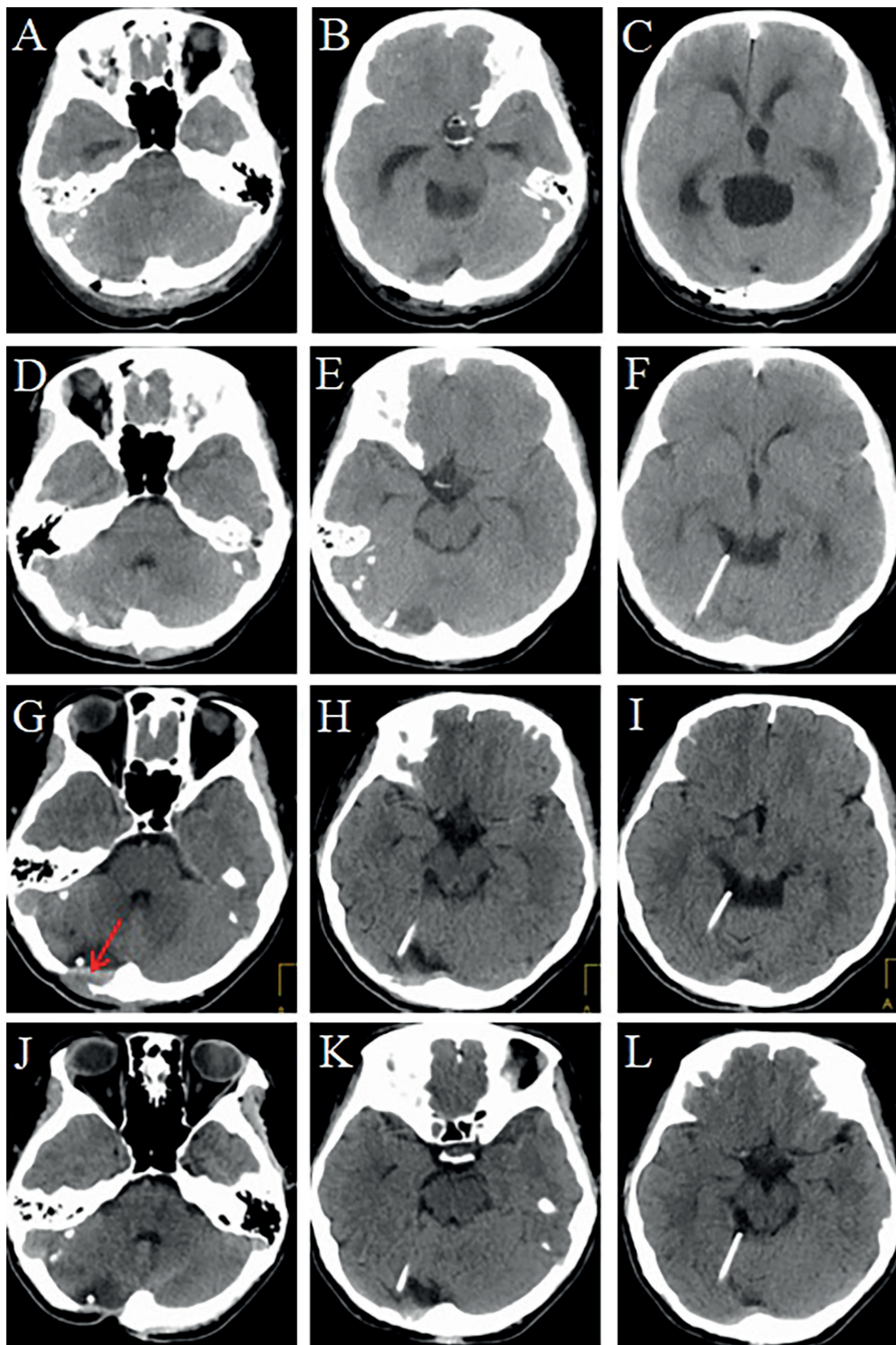


Figure 1. A-C, Axial head computed tomography (CT) scans after the pineal cystic lesion was resected using a supracerebellar infratentorial approach. A, The presence of the skull in the operative area. B, and C, show hydrocephalus and cyst formation. D-F, Axial head CT scans after the cystic lesion-cisterna magna drainage surgery. D, The presence of the skull in the operative area; the close connection between the drainage tube and the artificial dura. E, Hydrocephalus and the cyst were significantly reduced. F, The occipital bone was missing below the incision (the red arrow); and the soft tissue of the scalp was swollen; there was a close connection between the drainage tube and the artificial dura. G-I, Hydrocephalus and the cyst did not change before the first wound debridement. H-L, After wound healing, axial cranial CT scans showed no enlargement of hydrocephalus and the cyst (H, L), partial occipital defect (J), and no swelling of the scalp (J).

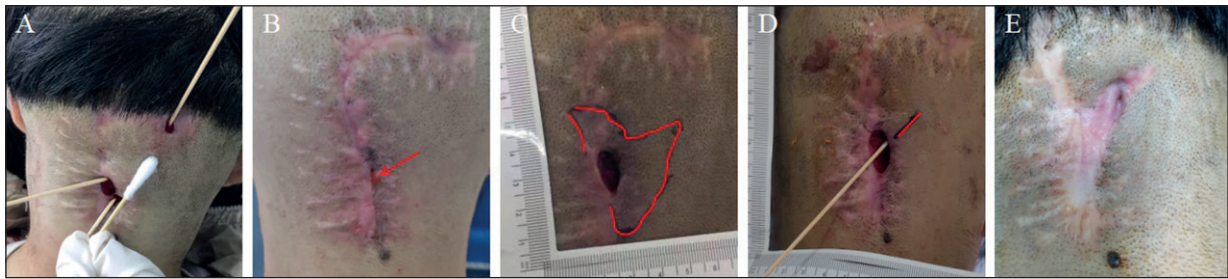


Figure 2. **A**, Following cystic lesion-cisterna magna drainage surgery, three places of scalp incisions were ulcerated, two of which were interlinked. **B**, After the second debridement, a punctate rupture appeared after wound healing (the red arrow). **C**, The rupture gradually increased, and a subcutaneous cavity formed (the red circle). **D**, The cavity gradually shrank following application of honey and silver ion dressing. **E**, The chronic wound healed after conservative treatment.

the cyst and the development of hydrocephalus with increased intracranial pressure. Taken together, these factors made surgical removal of the foreign bodies very risky.

Honey has been used clinically for many years as a safe, affordable, and effective treatment, and its use dates back 5,000 years⁸. Honey contains vitamins, minerals, proteins, enzymes, antioxidants, and compounds that endow it with antibacterial, antioxidant, anti-inflammatory, and immunomodulatory properties, which promote debridement and wound healing⁹. Honey promotes autolysis debridement and induces granulation tissue formation and epithelialization¹⁰. Honey removes necrotic tissue from wounds and reduces the use of antibiotics; importantly, repeated use of honey does not create resistance⁹. Taken together, these reasons make honey an effective alternative for treating chronic wounds. Moreover, silver ion dressings have low toxicity and few adverse reactions; these dressings can lead to destruction of cell membranes, allowing silver ions to enter into bacteria, resulting in bacterial death¹¹. Silver ions can also produce reactive oxygen species that cause cell membrane damage to achieve antibacterial purposes¹². Wound debridement and silver ion dressing changes did not improve wound healing in our case. Thus, using the antibacterial properties of silver ions alone did not improve the wound granulation. We used the antibacterial properties of honey, as well as its ability to induce autolytic debridement and granulation tissue formation, in combination with silver ions, to achieve complicated chronic wound healing of the scalp. This study provides a reference method for the treatment of complicated chronic wounds of the scalp using a combination of honey and silver ion dressings.

Conclusions

Chronic scalp wound formation after craniotomy increases trauma and economic burden for patients. The management of chronic scalp wound needs to be customized according to the pathophysiology of chronic scalp wound healing. The use of honey in combination with silver ion dressing is helpful in the treatment of complicated chronic wounds of the scalp.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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Informed Consent

Written consent was obtained from the parents of the patient.

Authors' Contribution

Investigation: Jianqiong Lin, Xu Yang; Methodology: Hongyuan Liu, Jianqiong Lin; Project administration: Zongping Li, Hongyuan Liu; Resources: Jianqiong Lin, Hongyuan Liu; Supervision: Zongping Li, Hongyuan Liu; Validation: Jianqiong Lin, Xiaohong Zeng, Yan Zhang; Original draft: Jianqiong Lin, Liling Yang; Review & editing: Zongping Li, Hongyuan Liu.

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ORCID ID

Jianqiong Lin: 0000-0003-2379-9874; Liling Yang: 0000-0002-2587-6266; Xu Yang: 0000-0002-7408-8178; Xiaohong Zeng: 0000-0001-5187-5841; Yan Zhang: 0000-0002-0384-7173; Zongping Li: 0000-0002-8779-8320; Hongyuan Liu: 0000-0001-9580-9715.

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