

CASE STUDY

Addressing silicone ventriculoperitoneal shunt hypersensitivity with teflon sheets: a case report

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Abstract

Ventriculoperitoneal (VP) shunts, used to treat hydrocephalus, can sometimes cause hypersensitivity reactions to silicone, necessitating repeated surgical interventions. Traditional management involves replacing silicone with alternatives like polyurethane, which have limitations. This study presents a novel approach using Teflon (PTFE) sheets to cover the silicone valve surface.

A 22-year-old male with a history of multiple shunt surgeries and wound revisions was admitted for wound dehiscence, suspected to be due to a late hypersensitivity reaction to silicone. The shunt valve and cranial entry point were wrapped in Teflon PTFE felt sheets, and the wound was closed with propylene sutures. The patient was treated with methylprednisolone and discharged after three days.

Follow-up showed complete wound healing within a month, and the patient remained revision-free for ten years. This case suggests that Teflon sheets may offer a promising approach for managing silicone hypersensitivity in VP shunts, though further studies are needed to determine its broader applicability.

Keywords case report, hypersensitivity, PTFE, Teflon, ventriculoperitoneal shunt

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Introduction

Ventriculoperitoneal (VP) shunts, commonly used to treat hydrocephalus, are typically made from silicone due to their flexibility and biocompatibility. However, hypersensitivity reactions to silicone, though rare, can lead to significant clinical complications such as skin breakdown, chronic inflammation, and allergic responses.^{1,2} These reactions are usually mediated by delayed-type hypersensitivity mechanisms involving cell-mediated immune responses.

In cases where silicone hypersensitivity occurs, repeated surgical revisions are often necessary, with traditional management involving replacing silicone components with alternative materials such as polyurethane. While polyurethane has been used successfully in some cases, it is not without its limitations, including an increased risk of infections and mechanical failures.³ Moreover, the availability of polyurethane in some regions is limited, particularly in developing countries.

Polytetrafluoroethylene (PTFE), commonly known as Teflon, is recognised for its biocompatibility and inert nature, making

it a potential alternative in cases of silicone hypersensitivity. PTFE has been evaluated as a material for cerebrospinal fluid shunting, though its porosity sometimes allows tissue ingrowth, which can complicate its use.⁴

We report a case in which a novel approach of using Teflon (PTFE) sheets to cover the silicone valve surface successfully prevented a hypersensitivity reaction.

Case report

A 22-year-old male with a history of multiple shunt surgeries and wound revisions after craniopharyngioma surgery (Figure 1) was admitted to our clinic for wound dehiscence after 1.5 years of no wound-related issues after previous surgery.

The patient was awake on the presentation, with a Glasgow Coma Scale of 15 and a normal neurological examination. Upon inspection of the wound, the shunt valve could be visualised; the surrounding skin was markedly erythematous, and loose propylene sutures could be seen from the recent attempts at primary closure (Figure 2). He had a body temperature of 36.7 with no history of fever. The patient had

a C-reactive protein level of 0.08 mg/dL, a procalcitonin level of 0.03 µg/L, and a white blood cell count (WBC) of 7.75 10³/µL.

With the patient’s previous history of three failed flap surgeries and his young age, an alternative diagnosis of late hypersensitivity reaction to silicone was considered. The patient was operated on, and the shunt valve and cranial entry point were wrapped in Teflon/Polytetrafluoroethylene (PTFE) felt sheets (Venaporta Ltd, Ankara, Türkiye). Then, the wound was approximated using 2–0 propylene sutures. The patient was put on a treatment regimen of methylprednisolone for two weeks that was planned to be tapered off, and the patient was discharged after three days in the inpatient unit.

After one month, the wound healed completely (Figure 2), and the patient is revision-free at ten years post-surgery (Figure 3). The PTFE sheet covering the shunt can be seen in the postoperative MRI (Figure 4).

Discussion

Hypersensitivity reactions to silicone are rare but significant clinical challenges, especially in patients requiring long-term implantable devices such as ventriculoperitoneal (VP) shunts. Silicone is widely used due to its flexibility and biocompatibility, yet it occasionally induces adverse immune responses. These reactions are typically mediated by delayed-type hypersensitivity mechanisms characterised by cellular immune responses and chronic inflammation.^{3,5-7}

In our case, the patient exhibited multiple episodes of wound dehiscence and inflammation, raising suspicion of a hypersensitivity reaction to the silicone VP shunt. The clinical presentation, including recurrent wound breakdowns and erythematous reactions, aligns with documented cases where silicone implants have led to similar complications. Such responses often involve the formation of granulomas and chronic inflammatory tissue.³⁻⁶



Figure 1. Timeline for the patient marking all the previous surgeries

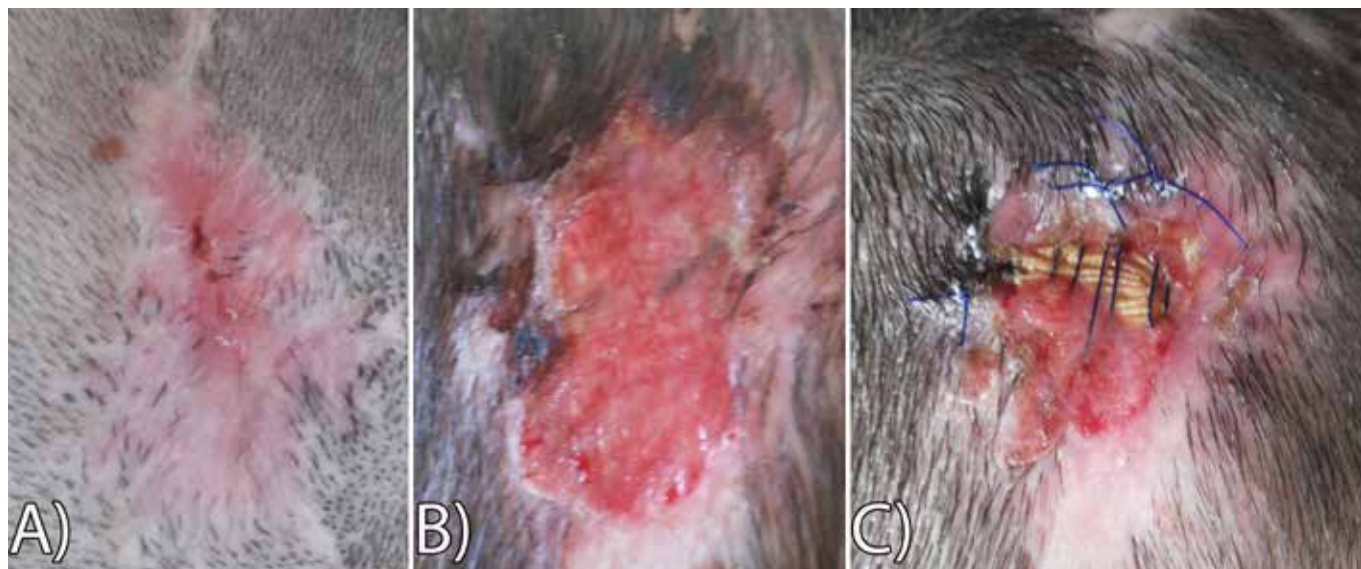


Figure 2. A) Over the course of the three months to his admission, the patient's shunt site first had (A) erythema, then (B) the epidermis eroded, leaving a thin red dermis layer. Then, (C) the skin completely opened up, revealing the fascia lata graft from previous surgeries, and propylene sutures from an attempt for reconstruction can be seen.

Traditional approaches to managing silicone hypersensitivity include replacing the silicone with alternative materials like polyurethane. However, these alternatives are not without complications. For instance, polyurethane shunts have been associated with their own issues, such as infections and

mechanical failures.⁶ Moreover, the availability of polyurethane shunts can be limited, as they are not readily accessible in every country and often rely on a single supplier, restricting options. Therefore, exploring new materials or protective strategies is crucial for improving patient outcomes.



Figure 3. 10-year follow-up photo of the patient.

In this study, we used Teflon (PTFE) sheets to cover the silicone valve of the VP shunt. Teflon, known for its excellent biocompatibility and inert properties, provided an effective barrier between the silicone and the patient's immune system. This approach successfully resolved the hypersensitivity reaction, as evidenced by the complete healing of the wound and the absence of further complications over a 10-year follow-up period. This innovative method highlights the potential of Teflon as a protective covering for silicone implants, offering a promising solution for patients with similar hypersensitivity issues.

Conclusions

The case presented demonstrates the successful resolution of a hypersensitivity reaction to a silicone VP shunt using Teflon (PTFE) sheets. This novel approach may offer a promising alternative for managing silicone hypersensitivity, particularly in cases where other alternatives, such as polyurethane, are not available. However, further studies are needed to evaluate the effectiveness and safety of this intervention in a broader patient population.

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None.

Conflict of interest

The authors declare no conflicts of interest.

Ethics statement

An ethics statement is not applicable.

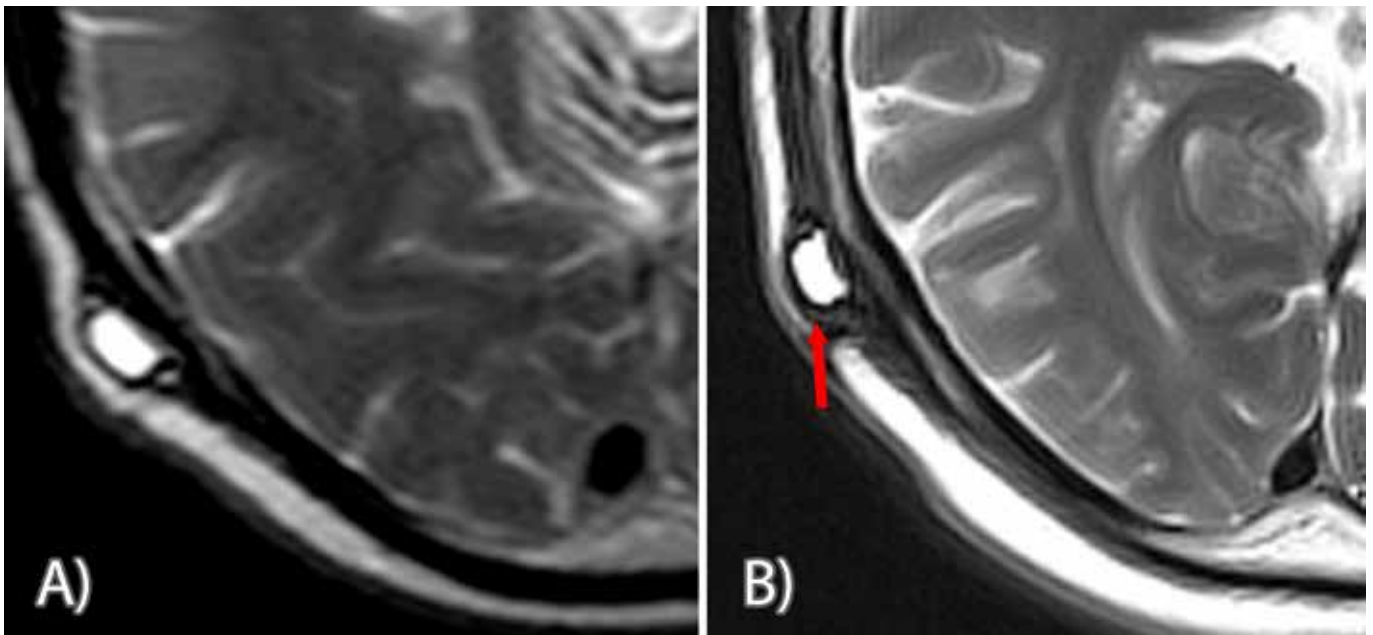


Figure 4. Preoperative (A) and postoperative (B) T2 sequence MRI demonstrating the PTFE layer over the shunt valve (red arrow)

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