

CASE REPORT **BREAST**

Perioperative anaphylaxis to povidone-iodine in breast prosthesis surgery: a case report

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Keywords: povidone-iodine, anaphylaxis, breast implants

Submitted: 2021 December 1 AEST Revised: 2022 February 24 Accepted: 2022 March 14 AEST

DOI: [10.34239/ajops.70223](https://doi.org/10.34239/ajops.70223)

Australasian Journal of Plastic Surgery

Vol 6, Issue 1, 2023 | 29 March 2023 AEST

Introduction

Povidone-iodine (PVP-I) is a water-soluble complex of polyvinylpyrrolidone (PVP) and iodine which acts as an iodophor.¹ It exists in a dynamic equilibrium, retaining most of the elemental iodine while slowly releasing free iodine.² This free iodine ‘ceiling’ supports a reduced level of skin irritation or toxicity vis-a-vis historical iodine tinctures,² while arguably providing the broadest antimicrobial spectrum among common antiseptics.¹ There is early evidence that PVP-I pocket rinse may reduce complication rates in breast prosthesis surgeries.³ Despite ubiquitous use, some misconceptions abound around allergies to PVP-I and so-called ‘iodine allergy’.^{4,5}

We describe an unusual case of anaphylaxis to PVP-I resulting in cardiorespiratory collapse, discuss its clinical context and learning points, and dispel some recurrent misconceptions.

Case

A 72-year-old woman underwent an expander-to-implant exchange for unilateral breast reconstruction following a left mastectomy for ductal carcinoma in situ four years prior. Her medical history was unremarkable aside from hypertension, osteoarthritis, a benign thyroid nodule and a rubber allergy.

The day surgery procedure under neuroleptic sedation and local anaesthetic was routine. Notably, PVP-I skin preparation was used. After expander explantation, the pocket was irrigated with, and the implant soaked in, PVP-I; there was no subsequent saline ‘washout’. Following a repeat

skin preparation and glove change, the implant was inserted and the incision closed—these precautions being common in our practice and that of several state-based peers.

In the immediate postoperative period, the patient displayed pallor and cyanosis, and rapidly deteriorated into cardiorespiratory failure. Advanced life support was initiated immediately. The anaesthetist noted good perfusion with CPR, and return of spontaneous circulation was achieved after 13 minutes and five doses of adrenaline. The patient was transferred to intensive care where protective hypothermia was instituted. Blood tests showed a latex score of 0, and a serum mast

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cell tryptase (90 minutes post-arrest) was mildly elevated at 8 µg/L (normal < 7 µg/L). Recovery was unremarkable, and aside from mild short-term amnesia, the patient did not suffer any neurological impairment. A follow-up echocardiogram and exercise thallium scan were unremarkable.

A clinical allergy specialist subsequently conducted intradermal testing of a comprehensive list of perioperative medications used in the episode. A positive wheal and flare response to PVP-I alone supported the aetiology of anaphylaxis. The patient has since worn a medical alert bracelet, fastidiously avoided PVP-I and has not experienced any further episodes in the decade since.

Discussion

Povidone-iodine has been known to incite immediate hypersensitivity, allergic and irritant contact dermatitis but through different components.⁵ Surfactants known as nonoxynols—common to many antiseptics including PVP-I and chlorhexidine—have been cited as the cause of irritant contact dermatitis.^{5,6} It should be noted that iodine of a concentration above 1 per cent is also an irritant;⁷ PVP-I in its ubiquitous 10 per cent aqueous formulation is equivalent to approximately 1 ppm free iodine.² The rate of allergic contact dermatitis to PVP-I and its coincident nonoxynols has been estimated at 0.4 per cent.⁸

In contrast, authentic immunoglobulin E-mediated (IgE-mediated) (Type I) PVP-I allergy and anaphylaxis is truly rare, with a 2019 international review tabulating a total of eight cases since 1998.⁵ A further search of PubMed shows that this report constitutes the ninth case (Supplementary table 1). In IgE-mediated hypersensitivity, povidone is the likely allergenic component.⁵ Povidone-specific IgE has been demonstrated in the serum of allergic patients,⁹ and immediate hypersensitivity and anaphylaxis to plain povidone has occurred,^{5,10} including in a patient who was known to be allergic to PVP-I.¹⁰ No rate of IgE-mediated hypersensitivity with PVP-I has been suggested in the literature to our knowledge. The rarity of nine immunologically tested cases over 25 years should be viewed in the context of the ubiquitous use of PVP-I worldwide as an over-the-counter, WHO-listed essential medication, which is virtually impossible to track, and is likely to be at least in the order of millions (of patient-use cases).

Predicting PVP-I allergy is very difficult, as it was in this patient with no prior unexplained immediate hypersensitivity reactions—the main

risk factor for perioperative anaphylaxis.⁵ This was despite the fact that povidone is present in many products; as coating or suspending agents in pharmaceuticals, hairspray dispersant or eyedrop surfactant.^{10,11} Any patient with a documented (and equally rare) allergy to plain povidone should not have PVP-I used on them.^{5,10} It is plausible that in our patient, PVP-I pocket washout during the original expander insertion may have been the sensitisation event.

In both our case and that reported by Caballero and colleagues in 2010, initial skin preparation with PVP-I did not trigger an allergic response, but subsequent application to a surgical wound in the same clinical episode did.⁵ Presumably, the transient increase in systemic povidone load precipitated by pocket washout or surgical wound contact allowed for the cascade of widespread IgE-mediated triggering of mast cells and anaphylactic sequelae. Local anaesthetic containing 1:80,000 adrenaline at the start of our procedure may have contributed to the estimated 15-minute delay from pocket irrigation to cardiovascular collapse.

Given the exceedingly low incidence of true Type I hypersensitivity to PVP-I, its mucosal or internal use should not be curtailed but be determined by clinical benefit. This is pertinent to the surgical profession considering there is early evidence that its use as an antiseptic rinse in breast prosthesis surgery decreases complication rates.¹² The potential for anaphylaxis should be borne in mind so that appropriate risk-minimisation (for example, saline washout) or prompt intervention (intramuscular adrenaline, etc) can be provided. In our practice, PVP-I implant rinse—which decouples electrostatic tension¹³—and pocket washout are still performed but are followed with a saline washout. This also provides an untainted field for efficient haemostasis.

The following misconceptions, however well-meaning, should be avoided.^{4,5} There is no evidence for ‘crossover’ of allergies to seafood, fish, iodinated contrast media (ICM) or other iodine-containing compounds to that of PVP-I.^{5,10} Parvalbumin and tropomyosin are the major allergens in fish, and crustacean or mollusc species respectively.⁵ Iodinated contrast media ‘allergies’ appear to be inconsistent with true IgE-mediated hypersensitivity in most cases, instead being dose-dependent mast cell and basophil degranulation events related to contrast hyperosmolarity or activation of the complement system.¹¹ Iodine is an essential element for thyroid hormone

synthesis, and lacks the epitopic complexity for immunogenicity. It follows that true 'iodine allergy' is not supported by evidence¹¹ and clinicians should avoid the term.

Conclusion

The greatest risk factor for perioperative anaphylaxis is a previous unexplained immediate hypersensitivity reaction.⁵ Allergies to fish, seafood or ICM do not overlap with PVP-I allergy—they have distinct epitopes. 'Iodine allergy' is a misnomer and should be avoided.

Anaphylaxis to PVP-I is a truly rare event. The possibility of a severe allergic reaction in practice should not be seen as an absolute contraindication to mucosal or internal use of PVP-I. This remains a decision that should be made in the context of clinical benefit, and is pertinent to many aspects of plastic surgery, including breast prosthesis surgery.¹² When pocket washout is performed, a precautionary saline rinse may be advisable. Clinicians should be aware that povidone is a potential rare allergen, and be competent at providing treatment for anaphylaxis in any setting regardless.

Patient consent

Patients/guardians have given informed consent to the publication of images and/or data.

Conflicts of interest

The authors have no conflicts of interest to disclose.

Funding declaration

The authors received no financial support for the research, authorship and/or publication of this article.

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