Surgical clips metal allergy postlaparoscopic cholecystectomy

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Introduction: Surgical clips and staples are the mainstay of wound closure in a multitude of surgical procedures such as cholecystectomies. These clips/staples are composed of a variation of different elements including titanium, aluminum, cobalt, and nickel—all of which can lead to type IV hypersensitivity reactions. Adverse effects of these hypersensitivities triggered through the release of mast cells and basophils can occur resulting in the development of atopic dermatitis, stomatitis, erythema, urticaria, and edema.

Presentation of case: We present a rare case of a patient who underwent cholecystectomy involving the use of metal surgical clips with adverse reactions. Postoperatively the patient complained of an array of symptoms including abdominal pain, fatigue, lethargy, joint aches, and nausea. The pain remained out of proportion to testing modalities, which time and time again were unremarkable. Following the withdrawal of the surgical clips the patients’ symptoms have resolved and remain in remission.

Discussion: Preoperative screening for metal allergies albeit rare can result in prevention of long-term adverse effects, as was the case with our patient. A detailed patient history and report can demonstrate any need for further testing. Patients should be advised of any and all side effects of surgical procedures including those that may occur as a result of hypersensitivity reactions to surgical clips and staples. Proper patient education can alert a patient with any triggering symptoms to receive prompt medical attention to prevent progression of infection and disease. Postoperative follow up is also recommended to allow both the patient and the physician to ensure the prevention of any arising complications both short and long term.

Conclusion: Proper preoperative history and physical examination warrants the detection of any pertinent allergies to metals, as well as other compounds. This allows for proper surgical approach. Surgeons may change their method and use other wound healing techniques involving sutures instead. Long-term adverse effects can be avoided ensuring proper patient healing and follow up.

Keywords: Metal clips allergy, Laparoscopic cholecystectomy, Surgery

Laparoscopic cholecystectomy is the standard of care for acute cholecystitis and replaced the conventional open cholecystectomies, which reduced postoperative recovery time, minimal scarring and incision, and decreased pain\textsuperscript{1}. Complications from surgical procedures are although common, the preceding issues are normally within days to weeks and are normally medically resolved. In this rare case, metal allergy complications procured from insertion of clips during cholecystectomy, which was unknown at the time and after the surgery, but rather showed signs of foreign body reaction.

The patient rather presented with no infectious symptoms from an abscess but rather showed signs of foreign body reaction. Following the withdrawal of the surgical clips the patients’ symptoms have resolved and remain in remission.

Preoperative screening for metal allergies albeit rare can result in prevention of long-term adverse effects, as was the case with our patient. A detailed patient history and report can demonstrate any need for further testing. Patients should be advised of any and all side effects of surgical procedures including those that may occur as a result of hypersensitivity reactions to surgical clips and staples. Proper patient education can alert a patient with any triggering symptoms to receive prompt medical attention to prevent progression of infection and disease. Postoperative follow up is also recommended to allow both the patient and the physician to ensure the prevention of any arising complications both short and long term.

Proper preoperative history and physical examination warrants the detection of any pertinent allergies to metals, as well as other compounds. This allows for proper surgical approach. Surgeons may change their method and use other wound healing techniques involving sutures instead. Long-term adverse effects can be avoided ensuring proper patient healing and follow up.

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Case presentation

A 54-year-old Caucasian female with past surgical history of tubal ligation, 2004, cholecystectomy, 2007, and total abdominal hysterectomy, 2009 presented to the surgery outpatient clinic for a request to remove metallic clips from her cholecystectomy procedure.

Patient presented with multiple of symptoms that had persisted since 2007 postcholecystectomy. Patient stated symptoms of myalgia, joint pain and tenderness, mental fogginess, mild forgetfulness, irritable bowel syndrome, stomach cramps, dry skin and hair, hair loss, vision changes with dry eyes, anxiety, decreased concentration, fatigue, hoarseness of voice, racing heart, high blood pressure, and hand tremors. The patient was dictating the constellation of symptoms during the time of visitation. Patient received a comprehensive IgG food allergy testing, which revealed allergies to dairy products such as casein, cheese, goat cheese, milk, whey and yogurt with addition to grains such as wheat and gliadin. Patient also had metal allergy testing conducted, which showed reactivity to cobalt, nickel, and mercury (Fig. 1). Despite allergy testing results she was unable to satisfactorily receive a reply from any surgeon who would help remove her clips that were made from cobalt, nickel and mercury.
She reached out to several physicians over the span of 16 years but none assessed her for the allergies but rather projected the symptoms as a cause of hypothyroidism—for which she never received a formal diagnosis, early menopausal symptoms, aging, and was listed as a hypochondriac.

Patient had normal vitals, complete blood count, comprehensive metabolic panel, and thyroid panel. Patient was scheduled for a laparoscopic removal of clips with fluoroscopy and further successful removal of 8 metallic clips and resultant alleviation of all symptoms 6 weeks postoperative. The work has been reported in line with the SCARE criteria[3].

**Discussion**

Surgical clips/staples are most commonly used as an alternative to suturing for ligation in patients undergoing several surgical procedures, especially cholecystectomies. Surgical clips/staples are normally used to close the cystic duct and artery in laparoscopic cholecystectomy to prevent bile leakage or bleeding[4]. The use of clips can be severe when prior allergy testing is not conducted and later unforeseen complications can be exacerbated.

Surgical clips/staples are commonly made from titanium alloy with 90% titanium, 5%–7% aluminum, 3%–5% vanadium, and <0.02% nickel, whereas some found to be made of stainless steel, which consists of alloy elements of 40%–68% iron, 8%–35% nickel, 20% chromium, 2% manganese, and 2%–3% molybdenum[5]. Lastly, cobalt-chromium-molybdenum surgical clips/staples are rarely used but made of 60% cobalt, 27%–30% chromium, and <5% nickel[5]. These 3 alloy implant elements are characteristically a cause of elemental allergy to titanium, cobalt, nickel, and chromium for the majority of the cases registered in literature, most commonly titanium.

Nickel allergy has predicated to show impact in patients with significant stressors of impaired metabolism, impaired glucose metabolism, increased body mass index, and increased inflammatory mediated effects[6]. These impacts are nonregulated before procedures and there is no significant evidence on the timeline of allergic complications has on patients. The essential group of physiological characteristics of the allergic impacts was seen in studies denoting obese females between 30 and 60 years of age[6].

Hypersensitivity to metal can be found in literature mostly in abundance to implants, but symptomatic patients have been noted to show signs to allergies, which consist of urticaria, eczema, edema, redness, facial erythema, atopic dermatitis, and stomatitis[7]. Developing hypersensitivities types I or IV have shown to be the triggering factors of degranulation, especially basophils being the causative agents triggering dermatologic symptoms[7].

In our patient, allergic testing was the only proven factor to metal allergy as no other mediating factors pointed toward the symptomatic patient. Evidently, nickel, cobalt, titanium, and chromium made surgical clips, which in some studies have shown high probability in delayed wound healing and also suggested that patients with history of contact dermatitis should avoid such applications[8]. Consequently, identifying metal allergies should be considered during outpatient preoperative visitation or during initial consultations.

**Conclusion**

Metal allergies are inevitable in a certain group, but can be rather controlled through testing, if the patient is unknown of their allergies to metal. The ability to clarify metal allergies during preoperative care can be a sign to control the techniques and also surgical equipment usage during the procedure. In part of using surgical metal clips/staples, a conversion to surgical suturing can be used to avoid allergic reactions and future complications. The benefit of using sutures can be applied in laparoscopic or robotic assisted cholecystectomies.
As in the case of this patient, a rather suturing technique ligate the cystic artery and cystic duct could have been a more pronounced option to avoid allergic and yet long-term complications. Therefore, prior allergy testing or a questionnaire during history and physical examination, should always be conducted before surgical intervention in all elective and urgent surgeries, but can be nonavoidable in emergent cases where prior medical records could be a benefit to the case.

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**Author contribution**

R.N.S.: data curation, writing, draft preparation, editor, reviewer, investigation, project administration. F.T.: supervision. J.J.: supervision. A.F.C.: writing, draft preparation.

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The authors declare that they have no financial conflict of interest with regard to the content of this report.

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**Guarantor**

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