

Misinterpretation of Silver Coated Wounds Dressing as Gastrograffin Bowel Leak: Case Report

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Abstract In recent years, a wide range of wound dressings containing elemental silver or a silver-releasing compound have been developed. The anti-microbial activity of silver is well documented in the literature with multiple studies illustrating its effect on a wide variety of organisms, including anaerobic and aerobic bacteria, fungi and viruses. As a metal, silver results in the appearance of artifacts in imaging studies. We report three cases that used different types of silver loaded dressings for the treatment of infected wounds. Computer tomography initially reported the silver loaded dressings as extravasations of the gastrograffin contrast medium. However, once the dressing was removed, the density disappeared. We present this case series to demonstrate this phenomenon.

Keywords: silver, gastrograffin, extravasation

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1. Case Presentations

The first case is a 27 years old male patient who presented with fecal discharge from the right iliac fossa with a clinical picture of necrotizing fasciitis due to bullet injury 4 days prior to his presentation. The patient underwent a laparotomy with right hemicolectomy, primary ileocolic anastomosis and extensive washout & debridement of the right iliac fossa anterior abdominal wall muscles. The patient's laparotomy wound and right iliac fossa wound were kept open and packed with Atrauman® Ag (Hartmann) wound dressing. On the tenth post op day, the patient developed fever and abdominal distention. An abdominal computerized tomography with oral gastrograffin contrast and intravenous contrast was performed. Initially an opacity was noted along the course of the midline and right iliac fossa wounds and was reported as an extravasation of contrast media suggesting a possible leak from the anastomosis as seen in Figure 1.

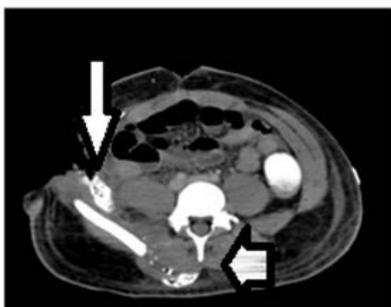


Figure 1. Wounds are packed with silver coated dressing (short and long arrow)

Suspecting this opacity may be secondary to the Silver coated dressing, the managing physician removed most layers of the Atrauman® Ag dressing, leaving in only one sheet of the dressing and the CT was repeated. Surprisingly the previously noted opacity disappeared completely despite the retained thin film as demonstrated in Figure 2.

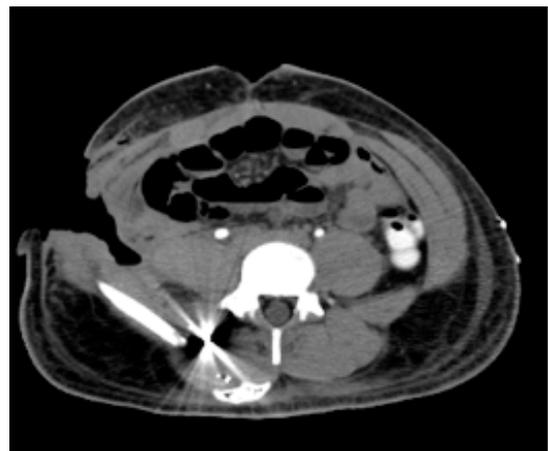


Figure 2. Silver Coated dressing was taken out from the anterior abdominal wall wound

Case 2: A 23 year old male motor vehicle accident victim sustained splenic injury and perianal laceration. The perianal wound was packed with ACTICOAT (Smith & Nephew) silver dressing. The Abdominal & Pelvis CT scan reported a contrast leak (Figure 3a). The dressing was removed in order to delineate a true gastrograffin contrast leak from an artifact.



Figure 3. a: Silver coated dressing in the perirectal cavity with gastrograffin in rectum; b: Silver coated dressing taken out and packed with Gauze; still Gastrograffin is seen in rectum

The third case is that of a patient who developed a severe wound infection post laparotomy with small bowel resection for bowel injury in a motor vehicle accident. The wound was managed with AQUACEL® Ag silver dressing (Conva Tec). A CT scan was done to rule out an intra-abdominal abscess. Again, we observed the silver dressing resulting in an opacity at the wound bed as seen in Figure 4. In this case Oral Contrast media was diluted but the dressing gave a Hounsfield Number close to gastrograffin contrast.



Figure 4. Anterior abdominal wound is packed with silver coated dressing. Clearly there is air around the dressing which may lead to misinterpretation

2. Discussion

As a topical antimicrobial agent, silver has been used for hundreds of years in wound care. Silver has been

employed in the prevention & management of wound infection in multiple forms & configurations; its solid elemental form (e.g. silver wire placed in wounds), as silver salt solutions used to cleanse wounds (e.g. silver nitrate solution) [1], and more recently as creams or ointments containing a silver-antibiotic compound (silver sulfadiazine cream) [2].

In recent years, a wide range of wound dressings containing elemental silver or a silver-releasing compound have been developed [3]. These dressings have overcome some of the problems associated with the first silver preparations. Namely, they are easier to apply, may provide sustained availability of silver, need less frequent dressing changes, in addition to providing additional benefits such as management of excessive exudate, maintenance of a moist wound environment and facilitation of autolytic debridement [4].

The first CT-images were produced in 1971 at Atkinson Morley's Hospital in London. Sir Godfrey Hounsfield was awarded the Nobel Prize in Physiology/Medicine along with Allan McLeod Cormack in 1979 for their work with CT scans [5].

Man is based on water and surrounded by air. This was the background for creating the linear Hounsfield scale where water represents a value of 0 and air represents a value of -1000. The complete formula was given as:

$$HU = 1000x((\mu X - \mu_{water}) / \mu_{water})$$

Typical values for different elements and tissues range from -1000 to more than +1000, i.e. from air to bone respectively. Of importance is that fat is -100, muscles and blood have a value of approximately +40. This makes it possible to evaluate things that do not have a specific structure – a spherical mass may be composed of fat or other elements, benign vs. malignant. Fluid-containing cavities (cysts) may contain fluids that appear watery or have an attenuation corresponding to blood. The differentiation between these various elements is of significant importance to the managing physician [6].

The CT images are most commonly calculated on a 512 x 512 pixel matrix, although 256 x 256 and 1024 x 1024 matrices may also be used. The density of tissues is either measured by CT number or Hounsfield Unit as shown in table 1. The Hounsfield number is a normalized value of the calculated x-ray absorption coefficient of a pixel in a computed tomogram. A normalized index of x-ray attenuation based on a scale of -1000 (air) to +1000 (bone), with water being 0; is employed in interpretation of CT imaging [7].

Table 1. The HU of common substances

Substance	HU
Air	-1000
Fat	-120
Water	0
Muscle	+40
Contrast	+130
Bone	+400 or more

Use of different CT scanning protocols leads to variations of up to 20% in the HU values. This can result in a mean systematic dose error of 1.5%. Specific conversion tables and automatic CT scanning protocol recognition could reduce dose errors of these types [8].

HU are also used to differentiate a uric acid calculus (low HU) from calcium-oxalate renal calculi (high HU)

which may help in determining the success rate of extracorporeal shockwave lithotripsy [9]. It is also helpful to evaluate the density of thrombus.

The Hounsfield unit thrombus measurement ratio can predict recanalization within vessels to predict the success of intravenous Recombinant Tissue Plasminogen activator endovascular treatment [10].

The gastrograffin contrast medium gives a measure of 500-1500 Hounsfield Unit in CT scan study depending on the adapted protocol.

In *the First case* the gastrograffin study gave 1000 HF unit which was close to that given off by the ATRUAMAN silver dressing (1200 HF unit). In *the second case* ACTICOAT silver dressing gave an estimated 1000-3000 HFU whereas the gastrograffin has an HFU value of 700-1000. In *the third case*, AQUACELL silver dressing was used giving off 500-700 HFU.

Such measurements had led to the initial misinterpretation of the CT scan study as a contrast leak.

Clinical suspicion in these cases of the possibility of the silver coated dressings resulting in an artifact led to prompt recognition & management of this problem resulting in accurate diagnosis. Hence, based on our report we find that it is advisable to have the silver coated dressings removed prior to abdominal or pelvic computerized tomography when oral or rectal Gastrograffin contrast is administered.

3. Conclusion

Silver Coated wound dressings are clearly radio-opaque dressings that can mimic a gastrograffin contrast leak, leading to miss interpretation of CT reports with the potential for inappropriate management if not promptly recognized.

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