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Large-Volume Iodinated Contrast Medium Extravasation: Low Frequency and Good Outcome After Conservative Management

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Introduction

• Incidence of CM extravasation: 0.1% - 0.9% \([1,2]\)
  – Most of the events were considered as mild (pain and swelling)
  – Larger volumes are generally thought to be associated with a higher risk of moderate-to-severe extravasation injuries \([4,5,6]\)

• No definite consensus on the effective management
  – Lack of enough evidence to prove the efficacy of various management
  – ACR manual \([1]\) and ESUR guideline \([3]\):
    * Patient monitoring, limb elevation, and warm/cold compresses

• The aim of this study
  – To retrospectively determine the frequency, management, and outcome of large-volume iodinated contrast medium extravasation of intravenous injections in our institution
Materials and Methods

• From January 2008 to June 2016, 64,676 consecutive intravenous injections of iodinated contrast medium were performed for radiology in our department
  – A senior nurse collected data, and each incident report was reviewed monthly.
  – Inclusion of CT scans and IVP studies (300-370 mg iodine/L, 36°C)
    * Hand injection
    * Auto-injector, rate 2-3 ml/sec
    * 20-gauge plastic needles at the arm or hand if possible
    * Return blood was confirmed, and a pretest with 5cc saline was routine
    * Associated discomfort was checked, and extravasation was recorded
  – Large-volume CM extravasation was defined as a CM leak \( \geq 20 \text{ ml} \)
Materials and Methods

- **The intercom alarm system** held in the patients’ hands
  - Educate to press the button if any discomfort occurs to terminate the examination
- **Protocols of management**
  - Avoided affected skin to contact povidone-iodine or a 70% alcohol solution
  - Injury sites were punched with **room-temperature water** for 5 minutes, dried with gauze
  - Treated with SILIVERZINE (**sulfadiazine silver**) ointment and CLOBETASOL CREAM (**clobetasol propionate**) 
  - Elevation of the affected limb above the level of the heart
  - Monitoring the patients
  - Health education
## Results

### Table 1. Overview of the Large-Volume Iodinated Contrast Media Extravasation

<table>
<thead>
<tr>
<th>Injection</th>
<th>Hand Injection</th>
<th>Auto-Injector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no. of patients</td>
<td>26,084</td>
<td>38,592</td>
<td>64,676</td>
</tr>
<tr>
<td>Incidence of extravasations</td>
<td>8 (0.03%)</td>
<td>18 (0.047%)</td>
<td>26 (0.04%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extravasation Volume</th>
<th>Hand Injection</th>
<th>Auto-Injector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-40 ml</td>
<td>4 (50%)</td>
<td>14 (77.8%)</td>
<td>18</td>
</tr>
<tr>
<td>40-60 ml</td>
<td>2 (25%)</td>
<td>1 (5.56%)</td>
<td>3</td>
</tr>
<tr>
<td>60-80 ml</td>
<td>0 (0%)</td>
<td>1 (5.56%)</td>
<td>1</td>
</tr>
<tr>
<td>&gt;80 ml</td>
<td>2 (25%)</td>
<td>2 (11.08%)</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptom/Sign</th>
<th>Hand Injection</th>
<th>Auto-Injector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swelling</td>
<td>8 (100%)</td>
<td>18 (100%)</td>
<td>26</td>
</tr>
<tr>
<td>Pain</td>
<td>4 (50%)</td>
<td>14 (77.8%)</td>
<td>18</td>
</tr>
<tr>
<td>Skin blister</td>
<td>2 (25%)</td>
<td>3 (16.7%)</td>
<td>5</td>
</tr>
<tr>
<td>Skin necrosis</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management</th>
<th>Hand Injection</th>
<th>Auto-Injector</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservative treatment</td>
<td>8 (100%)</td>
<td>18 (100%)</td>
<td>26</td>
</tr>
<tr>
<td>Dermatology consultation</td>
<td>2 (25%)</td>
<td>5 (27.8%)</td>
<td>7</td>
</tr>
<tr>
<td>Surgery</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0</td>
</tr>
</tbody>
</table>
Results

Table 2. Comparison between the hand-injection and auto-injector group

<table>
<thead>
<tr>
<th>Groups</th>
<th>No. of Patients</th>
<th>Mean Age (years)</th>
<th>No. of Studies</th>
<th>Injection sites</th>
<th>Mean volume of extravasation (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand-injection</td>
<td>8</td>
<td>74.6 (59-92)</td>
<td>CT: 6</td>
<td>Wrist/hand (2); Arm/forearm (4); Foot/ankle (2)</td>
<td>45 (20-90)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IVP: 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto-injector</td>
<td>18</td>
<td>65.8 (36-86)</td>
<td>CT: 18</td>
<td>Wrist/hand (4); Arm/forearm (7); Antecubital fossa (6); Foot/ankle (1)</td>
<td>37.8 (20-90)</td>
</tr>
</tbody>
</table>

- All extravasations involved in the use of non-ionic iodinated CM.
- Swelling occurred for 5 days, pain <3 days, skin blisters occurred 4-5 hours after injury and ruptured in 24 hours. Improvement occurred after 32 hours and scarring in about 4 days.
Results

• Management of CM extravasation
  – Conservative treatment for both groups
  – Further consulted dermatologists:
    2 patients (out of 8) in the hand-injection group
    5 patients (out of 18) in the auto-injector group

• No skin necrosis or compartment syndrome was seen, and no plastic surgery was used for decompression.
Discussion

• Incidence of large-volume extravasation (≥ 20 ml) is very low
  – Total incidence: 0.04%
  – Incidence of severe sequela (skin necrosis or compartment syndrome): 0%

• The procedures by means of both prevention and management are deemed to contribute to these impressive outcomes
Discussion - Prevention

• Procedures recommended by the published literature [1,3,6,7,8,9]
  – Type of IV needle: 20-gauge plastic needle whenever possible
  – Site of needle insertion: antecubital fossa whenever possible
  – A pretest of 5-ml normal saline
  – Flow rate of auto-injector: 2-3 ml/sec

• Patient’s education prior to the examination in our cases
  – Inform any discomfort by pressing an intercom alarm button being held in hands
  – An essential to prevent further damage to the already injured tissue
  – It works for most of the patients, including those cannot communicate orally, under most circumstances, as long as the patients are able to press the alarm button
  – It can be contributed to the low estimated volume of extravastes even in the auto-injector group
  – There is no published literature remaking on this tactic yet
Discussion - Management

• Procedures recommended by the published literature [1,3,5,6,7,10]
  – Elevation of the affected limb above the level of the heart without compromise to the arterial supply or venous return is accomplished

• Application of the ointment to the affected site 3 to 4 times/day in our cases
  – **SILIVERZINE (sulfadiazine silver) ointment**
    * Prevent secondary infection
    * Soothe the irritated skin possibly due to its relative insolubility and gradual dissolution without hypertonicity [11,12]

  – **CLOBETASOL CREAM (clobetasol propionate)**
    * Steroid is renowned for its anti-inflammatory effect
Discussion - Management

- Packing the affected site with mildly wet gauze of room temperature after application of the ointment in our cases
  - Full recovery without any exacerbation reported
  - There is no published literature concerning room-temperature packing
  - The postulation is that much milder stimulation from room-temperature packing than ice packs or warm compresses may cause no further possible damage to the distressed tissue
  - Prevent possible damage to the affected skin area by the patients themselves if too hot or cold dressing is applied
Discussion- Management

• Health education to the patients by the radiologists and nurses on spot
  – The aforementioned techniques
  – Recognition of exacerbating symptoms, which is followed by immediate visit to the hospital

• Follow-up of the patients by phone
  – By the nurse from the Radiology department
  – Hospital visit is strongly recommended if exacerbation is considered
Conclusions

• The incidence of large-volume CM extravasation in our institution is extremely low compared to that in the literatures.

• In addition to the techniques of management recommended in the literature, the intercom alarm system, routine application of SILIVERZINE (sulfadiazine silver) ointment and CLOBETASOL CREAM (clobetasol propionate), and mildly wet gauze of room temperature in our protocol of management are considered to be determinants to contribute to our impressive outcomes.
References


