Assess the Effectiveness of Magnesium Sulphate Dressing Versus Cold Compress in Patients with Intravenous Infiltrations

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Abstract
A study was conducted to compare the effectiveness of magnesium sulphate dressing versus cold compress in patients with intravenous infiltrations. The research method adopted for the study was quasi-experimental approach. Samples were divided in two groups, each consisting 30. Purposive sampling technique was used to select the sample for the study. The difference in reduction in intravenous infiltration of both groups is statistically significant; investigator feels that the magnesium sulphate dressing is better than cold compress for reducing intravenous infiltration.

Keywords: Effectiveness, Magnesium Sulphate Dressing, Cold Compress, Intravenous Infiltration

Introduction
Intravenous infusion of drugs, fluids and nutrients has become an indispensable practice in present day medical care. Venous cannulation via peripheral intravenous (PIV) catheter is the simplest and most frequently used method of administration.¹

Many surgical procedures including amputation may be required when certain drugs or fluids infiltrate and/ or disability may be the result. A common problem encountered in intravenous fluid administration is the infiltration of the fluids into tissues near the point of entry of the catheter into the veins or arteries (vascular system). Infiltration is often due to patient movement and disruption of the catheter. This may lead to discoloration, discomfort and tissue destruction as well as lack of delivery of the intravenous fluids or drugs into the patient’s system. Sometimes a line is keeping it ready to use in emergency & the use of intravascular lines is very common and a must, in managing patients who are expected to have gross fluid and electrolyte imbalance and a change in pressure is expected. The process may also begin with a chemical phlebitis caused by an irritating medication.²

Infiltration is defined as the “Inadvertent administration of nonvesicant medication or solution into the surrounding tissues.”

Need of the Study
The most common complication of peripheral venous cannulation is infiltration this results in an inflammatory reaction, which is manifested as pain, swelling and arrhythmia in some patient this inevitably leads to increase work load for medical and nursing staff and in some cases prolongs the duration of hospital stay.³

Incidence of extravasations range from 1% to 11%. It has an impact on the patient because it causes discomfort and pain. It causes increase health care cost and it reflects the quality of patient care. ⁴

Extravasation is a matter of concern in treatment, discomfort up to severe complications such as necrosis and amputation. The compliance with regulations concerning the application and injection or infusion of cytotoxic substances can minimize the risk of including an extravagations.⁵

Nursing studies and literature pertaining to care of intravenous infiltration is limited, and the procedures adopted for intravenous related infiltration management are varied. Individual accountability requires nurses to

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evaluate the care provider and therefore it is important for them to have access to reliable research-based knowledge to assess the reduction of intravenous infiltration.6

Statement of the Problem

“A comparative study to assess the effectiveness of magnesium sulphate dressing versus cold compress in patients with intravenous infiltrations in selected hospitals of Pune city”.

Objectives of the Study

- To assess the degree of intravenous infiltration in selected patients.
- To determine the effect of MgSO4 dressing for reducing intravenous infiltration.
- To determine the effect of cold compress for reducing intravenous infiltration.
- To compare the effectiveness of MgSO4 versus cold compress for reducing intravenous infiltration.

Operational Definition

Assess

(According to the Cambridge learner’s dictionary).

Assess means to make a judgment about the quality, size, and value of something.

In this study, it means to judge the effectiveness of magnesium sulfate versus cold compress for reducing intravenous infiltration.

Effectiveness

Effectiveness refers to achieving the result that you want checking for desired effect, intended result or outcome.

In this study, it means the outcome of intervention of magnesium sulfate versus cold compress for reducing intravenous infiltration.

Cold Compress

A pad of damp, thickly folded, soft absorbent cloth, dipped in cold water applied on affected area.

In this study it means application of cold compress using cloth dipped in cold water on infiltration site for twenty minutes applied four times a day.

Magnesium Sulphate

It is a chemical substance containing magnesium and sulphate.

In this study it means application of magnesium sulphate crystals on wet dressing that has to be applied for twenty minutes four times a day.

Intravenous Infiltration

It means penetration of the surrounding tissue by a fluid as from an intravenous line, the leaking or oozing of a fluid into the tissues.

In this study intravenous infiltration graded as mild to moderate infiltration on intravenous line site will be included with the following signs and symptoms: edema in any direction, pain and leaking or oozing of a fluid into the tissues, arrhythmias, blanching or burning.

Assumption

The magnesium sulphate dressing and cold compress reduces local signs and symptoms of infiltration on intravenous site and promote comfort of the patient.

Hypothesis

- H0: There will be no significant difference in the effect of magnesium sulphate dressing versus cold compress for reducing intravenous infiltration.
- H1: There will be significant difference in the effect of magnesium sulphate dressing versus cold compress for reducing intravenous infiltration.

Inclusion Criteria

- Patient who could respond and are conscious.
- Patient who have intravenous related mild or moderate infiltration.
- Only those who are willing to participate in the study.

Exclusion Criteria

- Patients who are unconscious and critically ill or delirious.
- Patients with severe infiltration or (Grade 4 infiltration) not included.

Research Methodology

- Research Approach: Quasi-experimental approach
- Research Design: Pre-test Post-test quasi experiment research design
- Settings: Two private Hospitals in Pune:- Bharati Hospital and Jahangir Hospital
- Population: All patients with intravenous therapy related infiltration
- Sampling Technique: Non probable convenient sampling method
- Duration of Study: One month
- Setting Criteria: Patients who are accessible during the study and willing to participate
- Sample Size: 60 patients (30 were selected for treatment with cold compress (group A) and 30 with magnesium sulphate dressing (group B)
- Research Variables: Demographic variables & knowledge
- Tools for data collection: Section A: Deals with the demographic data of the samples, which includes personal data of patient regarding age, sex, education, duration of hospitalization, duration of intravenous line (date of starting IV Line). Section B: Consists of Physical Parameters of the infiltrated

Sampling Criteria

The following criteria were set to select samples:
Inclusion Criteria
- Patients; who could respond, were conscious.
- Patient who have intravenous related mild or moderate infiltration.
- Only those who were willing participate in the study.

Exclusion Criteria
- Patient who are not willing to participate.
- Patients who were unconscious and critically ill and delirious.
- Patients with severe infiltration or (Grade-4 infiltration)

Plan for Data Analysis
The analysis was planned on the basis of objectives and hypothesis. The data analysis was planned to include descriptive and inferential statistics.

The data presented in table 1, shows that in the cold compress group, majority 11 (36%) of samples were in age group 20-30, with female ratio 16 (53%) and male 14 (47%) were educated up to the primary level and had the intravenous line for three days. In magnesium sulphate dressing group, majority of 13 (44%) samples were from age group 20-31 were females 13 (57%) and male 17 (47%) were educated up to the primary level and had intravenous line between three or four days majority of (40%). In both the groups, majority of patients (77%) and (67%) were hospitalized between 1-7 days. It deals with the analysis of data related to intravenous line related physical parameters.

The data presented in table 2 shows that in the cold compress group, majority (47%) of samples had intravenous line present on the dorsal aspect of the left-hand, while (10%) had in forearm of left hand. And in magnesium sulphate dressing group majority of (47%) had intravenous line on the dorsal aspect of the right hand, while (10%) in forearm of right hand. In cold compress group, majority

| S. No. | Demographic Variables | Group1 (cold compress) N=30 | Group2 (MgSo4 dressing) N=30 |
|--------|-----------------------|-----------------------------|-----------------------------|
| 1.     | Age                   |                             |                             |
|        | 20-30                 | 11                          | 13                          |
|        | 31-40                 | 8                           | 6                           |
|        | 41-50                 | 8                           | 7                           |
|        | 51-60                 | 3                           | 4                           |
| 2.     | Sex                   |                             |                             |
|        | Female                | 16                          | 13                          |
|        | Male                  | 14                          | 17                          |
| 3.     | Education             |                             |                             |
|        | Illiterate           | 11                          | 12                          |
|        | Primary education     | 16                          | 16                          |
|        | Higher secondary      | 3                           | 2                           |
|        | Graduate              | 3                           | 10                          |
|        | Post graduate         | 3                           | 7                           |
| 4.     | Duration of Hospitalization |                     |                             |
|        | 1-7 days             | 23                          | 20                          |
|        | 8-14 days            | 4                           | 13                          |
|        | 15-21 days           | 2                           | 7                           |
|        | 22-28 days           | 1                           | 3                           |
| 5.     | No. of days I/V line present |                     |                             |
|        | 1 days               | 1                           | 2                           |
|        | 2 days               | 3                           | 4                           |
|        | 3 days               | 16                          | 12                          |
|        | 4 days               | 10                          | 12                          |

The data presented in table 2, shows that in the cold compress group, majority 11 (36%) of samples were in age group 20-30, with female ratio 16 (53%) and male 14 (47%) were educated up to the primary level and had the intravenous line for three days. In magnesium sulphate dressing group, majority of 13 (44%) samples were from age group 20-31 were females 13 (57%) and male 17 (47%) were educated up to the primary level and had intravenous line between three or four days majority of (40%). In both the groups, majority of patients (77%) and (67%) were hospitalized between 1-7 days. It deals with the analysis of data related to intravenous line related physical parameters.

The data presented in table 2 shows that in the cold compress group, majority (47%) of samples had intravenous line present on the dorsal aspect of the left-hand, while (10%) had in forearm of left hand. And in magnesium sulphate dressing group majority of (47%) had intravenous line on the dorsal aspect of the right hand, while (10%) in forearm of right hand. In cold compress group, majority

Table 1. Demographic description of samples by frequency and percentage
(93%) samples was present on date of starting treatment. Magnesium sulphate dressing group, the sign and symptoms of phlebitis that is pain, swelling (93%) samples was present on the date of stating treatment.

The data presented in table 2 and figure 2, shows that in the cold compress group, majority (47%) of samples had intravenous line present on the dorsal aspect of the palm (left-hand).

The data presented in table 2 and figure 4, shows that in the cold compress group, majority of the patients had signs and symptoms of phlebitis (pain, swelling) (93%) on date of starting I/V line.

Table 2 and figure 5, shows that in the cold compress group, majority of (63%) samples had 1-3 cm of indurations of infiltration.

Table 2 and figure 6, shows that in the cold compress group, majority of (97%) patients had Intracath as most common type of intravenous line.

The data presented in table 2 and figure 7, shows that in the magnesium sulphate group, majority (47%) of samples had intravenous line present on the dorsal aspect of the palm (left-hand).

The data presented in table 2 and figure 8, shows that in the magnesium sulphate group, majority (46%) of patients had intravenous infiltration present for 3 days.

The data presented in table 2 and figure 9, shows that in the magnesium sulphate group, majority of the patients had signs and symptoms of phlebitis (pain, swelling) (93%) on date of starting I/V line.

| S. No. | Characteristics                                      | Cold compress (Group 1) | MgSO4 dressing (Group 2) |
|-------|------------------------------------------------------|-------------------------|--------------------------|
|       |                                                      | N=30                    | N=30                     |
|       |                                                      | Frequency | %  | Frequency | %  |
| 1.    | **Site of intravenous line**                         |            |    |           |    |
|       | Dorsal aspect of palm (left hand)                    | 14         | 47 | 14        | 47 |
|       | Forearm (left hand)                                  | 3          | 10 | 3         | 10 |
|       | Wrist (left hand)                                    | -          | -  | -         | -  |
|       | Dorsal aspect of palm (right hand)                   | 9          | 30 | 9         | 30 |
|       | Forearm (right hand)                                 | 1          | 3  | 1         | 3  |
|       | Wrist (right hand)                                   | 3          | 10 | 3         | 10 |
| 2.    | **Duration of infiltration present**                 |            |    |           |    |
|       | 2 days                                               | 9          | 30 | 8         | 27 |
|       | 3 days                                               | 18         | 60 | 14        | 46 |
|       | 4 days                                               | 3          | 10 | 8         | 27 |
|       | 5 days                                               | -          | -  | -         | -  |
| 3.    | **Signs, Symptoms of phlebitis on date of starting I/V line** |            |    |           |    |
|       | Pain, swelling                                      | 28         | 93 | 28        | 93 |
|       | Pain, swelling, erythema                             | 1          | 4  | 1         | 4  |
|       | Pain, swelling, erythema, increased temperature      | 1          | 3  | 1         | 3  |
| 4.    | **Indurations of infiltration**                      |            |    |           |    |
|       | 1-3 cm                                               | 19         | 63 | 26        | 87 |
|       | 4-6 cm                                               | 11         | 37 | 4         | 13 |
|       | 7-9 cm                                               | -          | -  | -         | -  |
|       | 10-12 cm                                             | -          | -  | -         | -  |
| 5.    | **Types of I/V devices**                             |            |    |           |    |
|       | Scalp vein                                           | 1          | 3  | 1         | 3  |
|       | Intracath                                            | 29         | 97 | 29        | 97 |
Figure 2. Distribution of characters according to site of intravenous line in cold compress group.

Figure 3. Distribution of characters according to duration of infiltration present in cold compress group.

Figure 4. Distribution of characteristics according to sign and symptoms of phlebitis on date of starting I/V line in cold compress group.

Figure 5. Distribution of characteristics according to Indurations of infiltration in cold compress group.

Figure 6. Distribution of characteristics according to types of I/V device in cold compress group.

Figure 7. Distribution of characters according to site of intravenous line in magnesium sulphate group.

Figure 8. Distribution of characters according to duration of infiltration present in magnesium sulphate group.

Figure 9. Distribution of characteristics according to signs and symptoms of phlebitis on date of starting I/V line in magnesium sulphate group.
Data presented in Table 3, shows that the mean score of degree of infiltration in pre intervention on day-1 was 1.2667 and on day-2 mean score was 0.1333 than on day-3 mean score became zero. The mean score of degree of infiltration in post intervention on day-1 was 1.2667, on day-2 mean score was zero and on day-3 mean score became zero.

Table 3. Description of Mean and SD of degree of infiltration in pre and post intervention of the Cold compress

| S. No. | No. of days cold compress given | Pre-intervention N=30 | Post-intervention N=30 |
|-------|---------------------------------|-----------------------|------------------------|
|       |                                 | Mean                  | SD                     | Mean                  | SD |
| 1.    | Day-1                           | 1.2667                | 0.4422                 | 1.2667                | 0.4422 |
| 2.    | Day-2                           | 0.1333                | 0.4269                 | 0                     | 0 |
| 3.    | Day-3                           | 0                     | 0                      | 0                     | 0 |

Data presented in Table 4, shows that the mean score of intensity of pain in pre intervention on day-1 was 2.133; on day-2 mean score was 1, on day-3 mean score was zero. The mean score of intensity of pain in post intervention on day-1 was 1, on day-2 was 0.7 and on day-3 it decreased to zero.

Table 4. Mean and SD of intensity of pain before and after intervention with cold compress

| S. No. | No. of days cold compress given | Pre-intervention N=30 | Post-intervention N=30 |
|-------|---------------------------------|-----------------------|------------------------|
|       |                                 | Mean                  | SD                     | Mean                  | SD |
| 1.    | Day-1                           | 2.233                 | 0.761                  | 1                     | 0 |
| 2.    | Day-2                           | 1                     | 0                      | 1                     | 0 |
| 3.    | Day-3                           | 0                     | 0                      | 0                     | 0 |

Data presented in Table 5, shows that the mean score of degree of infiltration in pre intervention on day-1 was 1.2 and on day-2 mean score was 0.2 and on day-3 mean score become zero. The mean score of degree of infiltration in post intervention on day-1 was 1.2, on day-2 mean score was zero and on day 3 it remained zero.

Table 5. Description of Mean and SD of degree of infiltration in pre and post intervention of the Magnesium sulphate dressing group

| S. No. | No. of days Magnesium sulphate dressing given | Pre-intervention N=30 | Post-intervention N=30 |
|-------|-----------------------------------------------|-----------------------|------------------------|
|       |                                               | Mean                  | SD                     | Mean                  | SD |
| 1.    | Day-1                                         | 1.2                   | 0.4761                 | 1.2                   | 0.4761 |
| 2.    | Day-2                                         | 0.2                   | 0.4761                 | 0                     | 0 |
| 3.    | Day-3                                         | 0                     | 0                      | 0                     | 0 |

Data presented in Table 6, shows that the mean score of intensity of pain in pre intervention on day 1 was 2.133; on day-2 mean score was 1, on day-3 mean score was zero. The mean score of intensity of pain in post intervention on day-1 was 1, on day-2 mean score was 0.7 and on day-3 it decreased to zero.

Table 6. Mean and SD of intensity of pain before and after intervention with Magnesium sulphate dressing group

| S. No. | Days Magnesium sulphate dressing done | Pre-intervention N=30 | Post-intervention N=30 |
|-------|---------------------------------------|-----------------------|------------------------|
|       |                                       | Mean                  | SD                     | Mean                  | SD |
| 1.    | Day-1                                 | 2.133                 | 0.763                  | 1                     | 0 |
| 2.    | Day-2                                 | 1                     | 0                      | 0.7                   | 0.458 |
| 3.    | Day-3                                 | 0                     | 0                      | 0                     | 0 |

Data presented in Table 7, shows that in cold compress group on day-1 the mean score of observation of infiltration site for edema was 1.2667, on day-2 mean score was 0.1333 and on day-3 mean score was zero. In magnesium sulphate dressing group on day-1 mean score of observation of infiltration site for edema was 1.2, on day-2 mean score was 0.2 and on day-3 it became zero.

Table 7. Mean and SD of observation of infiltration site for edema in cold compress and magnesium sulphate dressing group

| S. No. | Days | Cold compress N=30 | Magnesium sulphate dressing N=30 |
|-------|------|-------------------|----------------------------------|
|       |      | Mean              | SD                               | Mean              | SD |
| 1.    | Day-1| 1.2667            | 0.4422                           | 1.2               | .4761 |
| 2.    | Day-2| 0.1333            | 0.4269                           | 0.2               | .4761 |
| 3.    | Day-3| 0                 | 0                                | 0                 | 0 |

Data presented in Table 8, shows that in cold compress group on day-1 the mean score of observation of infiltration site for erythema was 0.8, on day-2 mean score was 0.0667, and on day-3 mean score was zero. In magnesium sulphate dressing group on day-1 the mean score of observation of
infiltration site for erythema was 0.733, on day-2 mean score was 0.0667 and on day-3 it became zero.

**Table 9.** Mean and SD of observation of infiltration site for skin changes in cold compress and magnesium sulphate dressing group

| S. No. | Days   | Cold compress N=30 | Magnesium sulphate dressing N=30 |
|--------|--------|---------------------|----------------------------------|
|        |        | Mean                | SD                               | Mean               | SD       |
| 1.     | Day-1  | 1.0667              | 0.6289                           | 1.0667             | 0.6799   |
| 2.     | Day-2  | 0.0667              | 0.2494                           | 0.0667             | 0.2494   |
| 3.     | Day-3  | 0                   | 0                                | 0                  | 0        |

Data presented in Table 9, shows that in cold compress group on day-1 the mean score of observation of infiltration site for skin changes was 1.0667, on day-2 mean score was 0.0667 and on day-3 mean score was zero. In magnesium sulphate dressing group on day-1 the mean score of observation of infiltration site for skin changes was 1.0667, on day-2 mean score was 0.0667 and on day-3 it became zero.

**Table 10.** Description of intensity of pain in cold compress and magnesium sulphate dressing during both pre and post intervention

| S. No. | Group                      | Pre-intervention | Post-intervention |
|--------|---------------------------|------------------|------------------|
|        |                           | Frequency | % | Frequency | % |
| 1.     | **Cold compress (A)**     |            |    |           |    |
|        | No pain                   | 0         | 0 | 0         | 0  |
|        | Mild                      | 0         | 0 | 30        | 100%|
|        | Moderate                  | 26        | 86.6% | 0 | 0 |
|        | Severe                    | 4         | 13.3% | 0 | 0 |
| 2.     | **Magnesium sulphate dressing (B)** | | | |
|        | No pain                   | 0         | 0 | 0         | 0  |
|        | Mild                      | 1         | 3.3% | 30        | 100%|
|        | Moderate                  | 26        | 86.6% | 0 | 0 |
|        | Severe                    | 3         | 10%  | 0         | 0  |

Table 11, shows that in Pre intervention of cold compress group majority of patients (86.6%) experienced moderate pain. In Post intervention, it was seen that 100% patients had mild pain. In Pre intervention of magnesium sulphate dressing group majority of patients (86.6%) experienced moderate pain. In Post intervention, it was seen that 100% patients had mild pain.

**Table 11.** Mean and SD of observation of behavior pain assessment in cold compress and magnesium sulphate dressing group

| S. No. | Days   | Cold compress N=30 | Magnesium sulphate dressing N=30 |
|--------|--------|---------------------|----------------------------------|
|        |        | Mean                | SD                               | Mean               | SD       |
| 1.     | Day-1  | 2.233               | 0.761                           | 2.133             | 0.763   |
| 2.     | Day-2  | 1                   | 0                               | 1                 | 0       |
| 3.     | Day-3  | 0                   | 0                               | 0                 | 0       |

**Conclusion**

Extravasation is a matter of concern in treatment. It may range from patient’s discomfort up to severe complications such as necrosis and amputation. The compliance with regulations concerning the application and injection or infusion of cytotoxic substances can minimize the risk of including an extravasations. The rate of infiltration increases with the time that the cannula remains in place, and for this reasons, the use of MGSO4 compress with limb elevation and sometimes cold compress may be very effective to reduce the intravenous infiltration. Hence in this proposed study the investigator felt a need to conduct the study so as to compare the effect of MGSO4 dressing and cold compress for reducing intravenous infusion related infiltration.

**Conflict of Interest:** None

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