

# Descriptive study of the frequency of medical adhesive–related skin injuries in a vascular clinic



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*A medical adhesive can be defined as a product used to secure a device (ie, tape, dressing, catheter, electrode, and ostomy pouch) to the skin. Skin injury related to medical adhesive usage occurs across all care settings with medical adhesive–related skin injuries (MARSIs) playing a significant role with patient safety. The purpose of this descriptive prospective study was to assess all adult patients with wounds seen in the vascular clinic for MARSIs by the CWOCN NP over a 3-month time period. One hundred twenty patients comprising a total of 207 visits were seen by the CWOCN NP over the 3-month time frame. Seven patients presented to the clinic from home with MARSIs for a frequency of 5.8%. There were four males and three females with ages ranging from 52 to 83 years with a mean age of 67.7 years. All patients had a diagnosis of peripheral vascular disease with MARSIs present on the lower extremities. Six of the seven MARSIs cases were related to having paper tape removed from the periwound skin at home resulting in epidermal stripping either by the home health care professional (N = 4) or by the patient themselves (N = 2). The other MARSIs was related to tension blister from steri-strips applied with benzoin by health care professional on a lower leg incision. Patients were unclear as far as when these injuries had occurred and often remarked that they thought that tape injuries were unpreventable. There is a need for additional research studies examining MARSIs frequency across care settings such as the vascular population to identify those at risk and then implement measures to prevent it. (J Vasc Nurs 2017;35:86-89)*

## INTRODUCTION

A medical adhesive can be defined as a product used to secure a device (ie, tape, dressing, catheter, electrode, and ostomy pouch) to the skin.<sup>1</sup> Certain tapes, dressings, and devices can also function as medical adhesives. Common types of adhesives include acrylates, latex, hydrocolloids, polyurethane, and silicone-based adhesives. The backings of the adhesive (ie, paper, plastic, silk, cloth, elastic, foam) provide the stretch, conformability, and rigidity of the adhesive.<sup>2</sup> Medical adhesives are pressure sensitive, where firm pressure applied to the surface of the adhesive will increase surface area contact and thus activate the adhesive. Skin injury occurs when the skin to tape adhesion is stronger than adhesive forces between the skin cells and skin layers so that they separate when the tape is peeled off.<sup>1-3</sup>

Types of medical adhesive–related skin injuries (MARSIs) may include mechanical injuries such as skin tears, epidermal

stripping, tension (blister) injuries, maceration, folliculitis, and contact/allergic dermatitis. A MARSIs may present itself as erythema and/or other skin abnormality (ie, vesicle, bulla, erosion, or tear) which is present for greater than 30 minutes after removal of the adhesive.<sup>1</sup> MARSIs occurs when tape causes stripping, separation, or tearing of the epidermal layers of the skin. Erythema can occur upon just removing tape from the skin. Stripping may occur when the tape is stronger than the skin layers, causing removal of superficial layers of the dermis upon tape removal. Blisters may form if you apply tape or steri-strips with tension and the tape restores its shape but pulls apart epidermal layers of the skin. Skin tears can occur when you apply or remove tape with tension or if friction causes the skin layers to separate.<sup>4</sup>

MARSIs is an underrecognized complication that is thought to impact at least 1.5 million people each year in the United States.<sup>5</sup> MARSIs is often perceived to be a minor injury but can be significant, and complications such as infection especially in those with a compromised vascular status can increase morbidity. Unfortunately, MARSIs is also often regarded as an inevitable part of aging. In a study of 155 residents in a long-term care facility who were at least 65 years of age, the incidence of new tape-related skin injuries was 15.5% over an 8-week period with skin injuries developing at 34 sites in 24 patients.<sup>5</sup> Cerebrovascular disease was the most common underlying disease in the subjects with skin injuries, followed in order by pressure ulcers and cardiovascular disease.<sup>5</sup>

The older adult is very susceptible to MARSIs with intrinsic risk factors including skin thinning, laxity, and fragility. With aging, the epidermis and the subcutaneous fat layers become thinner especially on the face, dorsal surface of hands, and shins and plantar aspects of feet which makes the skin more susceptible to

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mechanical forces such as friction, shear, and trauma. The blood vessels of the dermis become more fragile which can increase the risk of bleeding underneath the skin (senile purpura) which impacts skin integrity. The epidermal projections (rete ridges) that “lock together” the epidermis to the dermis, flatten between the dermal–epidermal junction with aging making the connections between the epidermis and dermis looser and weaker increasing the risk for tearing injuries from external forces such as tape removal.<sup>6</sup> Other risk factors for MARSIs seen in the older adult may include the following: application and removal of compression stockings, frequent blood draws, history of falls, polypharmacy, use of prosthetic devices, and moisture-associated skin damage such as incontinence.<sup>7</sup> Risk factors for MARSIs pertinent to the vascular population in addition to those seen in the older adult population include the following: those that are malnourished and/or dehydrated, those that have mobility issues, those with skin that is very dry or flaky as well as skin that is constantly moist, those with dermatologic conditions such as venous dermatitis, and those on certain medications (ie, anti-inflammatory agents, anticoagulants including antiplatelet medications, chemotherapy and immunosuppressive agents, and long-term corticosteroids) that can affect skin integrity.<sup>1,2,7,8</sup> Certain comorbidities such as diabetes mellitus, heart failure, renal insufficiency, peripheral arterial disease, lymphedema, and chronic venous insufficiency can also increase the risk.<sup>1,2,7,8</sup>

Vascular patients often may have central venous access devices, peripherally inserted central catheter lines, and ventricular assist devices which require repeated dressings and taping thereby increasing risk for MARSIs. Few studies have been published that examine the incidence or effects of repeated adhesive application and removal in clinical situations in which adhesives are worn over extended periods and with repeated application.<sup>8</sup> Konya et al<sup>5</sup> evaluated skin injury from medical adhesives in a population aged 65 years and older and reported a 20% (8 skin injuries out of 40 sites) incidence rate at “hyperalimentation” infusion sites. Hitchcock and Savine<sup>9</sup> reviewed the literature regarding skin integrity associated with ventricular assist devices and peripherally inserted central catheter lines and found that most of the literature on these devices focused on skin tears and irritant contact dermatitis underneath the dressings. Broadhurst, Mourea, and Ullman conducted a cross-sectional, descriptive survey of 1,044 clinicians in 34 countries with the majority of respondents, nurses from North America (81%).<sup>10</sup> There was wide variance in the management of central venous access device sites with impaired skin integrity, such as rash, skin stripping/adhesive-related injuries, and drainage. The authors concluded that additional research and education is necessary to ensure that device care is undertaken effectively to minimize preventable skin complications.<sup>10</sup>

## METHODS

A 585-bed level 1 trauma health care system served as the study site. A prospective observational research design was used to assess the frequency of MARSIs seen by the CWOCN NP for 3 months in the outpatient vascular clinic. The CWOCN NP sees all of the patients with acute or chronic wounds in the vascular clinic. At the scheduled clinic visit, a total head-to-toe assessment of the patient’s skin was completed. If MARSIs were present, then it was recorded.

For the purpose of the study, frequency was defined as the number of new cases of MARSIs seen in the vascular clinic population over 3 months by the CWOCN NP. Descriptive statistics were used to describe the sample.

## RESULTS

One hundred twenty patients comprising a total of 207 visits were seen by the CWOCN NP over the 3-month time frame. Seven patients presented to the clinic from home with MARSIs for a frequency of 5.8%. There were four males and three females with ages ranging from 52 to 83 years with a mean age of 67.7 years. All patients had a diagnosis of peripheral vascular disease with MARSIs present on the lower extremities. Six of the seven MARSIs cases were related to having paper tape removed from the periwound skin at home resulting in epidermal stripping either by the home health care professional (N = 4) or by the patient themselves (N = 2). The other MARSIs was related to tension blister formation from steri-strips applied with benzoin by health care professional on a leg lower leg incision. Patients were unclear as far as when these injuries had occurred and often remarked that they thought tape injuries were unavoidable.

## DISCUSSION

Skin injury related to medical adhesives is an underrecognized and potentially avoidable complication which occurs across all care settings and patient populations. There are very few studies that have been published that describe the frequency of MARSIs in specific care settings and patient populations and the studies that are described use different methodologies and so are difficult to compare. No studies addressing the frequency in outpatient vascular surgery clinics could be found.

Most of the studies looking at skin injury related to medical adhesives have been done with patients undergoing orthopedic surgery and specifically address tape blisters. Jester et al<sup>11</sup> conducted a quasiexperimental design used to investigate the prevalence and causation of wound blistering in a convenience sample of 169 patients following total hip and knee replacement. Data were collected at four time intervals to assess if wound blistering had occurred between surgery and 72 hours postoperatively. From the total sample (n = 169), 22 patients (13%) developed blisters. No statistically significant difference was found between any of the independent variables (type of dressing, type of skin preparation, known allergies, or use of steroids) ( $P = .05$ ) and the prevalence of blistering.<sup>11</sup>

Polatsche et al<sup>12</sup> conducted a retrospective case series of 103 hip fracture patients to determine the incidence of tape blisters at their institution. They found that tape-related injuries occurred in 22 patients (21.4%). Patient age, sex, number of medical comorbidities, smoking history, nutritional status, and type of surgery were not statistically significantly associated with risk for developing tape blisters.<sup>12</sup>

Ter et al<sup>13</sup> conducted a prospective, randomized trial of two adhesive products, a nonwoven porous adhesive bandage (NPAB) and transparent film adhesive bandage (TFAB), to evaluate skin integrity on 300 patients who underwent hip and knee surgery. Medical adhesive–related skin damage was observed in 22 (7.3%) of the sample. Skin damage occurred in 4.0% (n = 6) of

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