Iodoform Gauze Removes Necrotic Tissue from Pressure Ulcer Wounds by Fibrinolytic Activity

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Iodoform gauze is used in clinical practice for treatment of infected wounds. However, effectiveness and action mechanism of iodoform gauze for removal of necrotic tissue are unknown. We therefore employed case control and biochemical studies in order to clarify the pharmacological activity of iodoform gauze. A clinical study demonstrated that treatment with iodoform gauze removed necrotic tissue more effectively than treatment with conventional ointments. More than 60% of iodoform gauze-treated wounds were completely debrided within 2 weeks. Consistent with the clinical observation, biochemical analyses revealed clear differences in wound fluid proteins after treatment with iodoform gauze or conventional gauze. The amount of macroaggregates of type I collagen from wounds were remarkably decreased in iodoform gauze. Moreover, iodoform gauze and iodoform itself released non-aggregative type I collagen from necrotic debris in vitro. Taken together, we conclude that iodoform gauze efficiently removes necrotic tissue by its lytic activity for collagen fibers.

Key words: iodoform gauze; pressure ulcer; collagen; necrotic tissue; debridement

Iodoform (triodomethane, CHI₃) consists of yellow crystals or a crystalline powder with an irritating odor. Historically, Serulla discovered the chemical in 1822, and in 1843, Dumais announced its composition. In 1880, iodoform was first used in medical practice by Bouchardat. Currently, iodoform gauze (IG), composed of iodoform and gauze, is used for disinfection, based on the experience of clinicians. Iodoform, reduced by wound fluids, exhibits antimicrobial activity after topical application to wounds. Debridement is essential for managing necrotic wounds such as arterial or venous leg ulcers, pressure sores, or burns. Several methods for wound debridement are available, for example, surgical excision of necrotic tissue, repeated application of moistened dressings (saline-soaked gauzes), hydrocolloid or semiocclusive dressings, dextranomers, intracavity gels, or various enzyme preparations. Surgical debridement is obviously the most effective method, however, it cannot always be performed in elderly patients because of the physical pain and mental stress. Therefore, chemical debridement by topical agents is required in practice. In the past 20 years, several enzymatic products for wound debridement, such as Elase (fibrinolysin/DNAase, Parke-Davis Pharmaceutical, Hoofddorp, the Netherlands) and Novuxol (collagenase, Knoll Pharmaceutical, Ludwigshafen, Germany), have been developed. However, those products are no longer available because of the lack of stability of the raw materials.

At the initial stage of a deep pressure ulcer, necrotic tissue is usually present within a wound. Necrotic tissue in a pressure ulcer wound usually consists of dermis, fatty tissue, fascia, tendon and ligament, which are abundant in collagenous extracellular matrix, consisting mainly of type I collagen. Since treatment of deep pressure ulcers is initiated by debridement, topical agents used for this initial stage are required to have lytic activity for collagenous tissues.

In the present study, we have demonstrated the effectiveness and the action mechanism of IG in a retrospective observation study and by biochemical analyses and conclude that IG debrides a wound through its collagenolytic activity.

MATERIALS AND METHODS

Wound Data Collection The study was conducted at the National Center for Geriatrics and Gerontology Hospital, (NCGG, Obu, Japan). NCGG provides general medical services including emergency, and admits approximately 5000 patients per year (more than 90% of patients are elderly, over 65 years old) in a 300 bed hospital facility. Patients with pressure ulcers are managed by a specialized team at least once a week.

A list of pressure ulcer patients with necrotic tissue was extracted from a pressure ulcer database of NCGG, which allowed the identification of potential study patients. In order to create a database, all patients with pressure ulcers were systematically recorded during a 2-year period (from June, 2008 through May, 2010). The percentage of the hospitalized patients with pressure ulcers ranged from 2.8 to 11.0% during the period. The size of every pressure ulcer was measured and photographed at least once a week. The depth of pressure ulcers was determined according to the criteria of NPUAP (National Pressure Ulcer Advisory Panel).

A retrospective observational study was conducted with wound-cleaning capacity as the primary outcome for 60 patients treated with IG or conventional ointment therapy during the past two years. The size of the wounds was measured at least once a week, and the area was calculated according to the Japanese guidelines. The clinical information about patients including laboratory data for thyroid function (5 patients) and their wounds was obtained from the medical records and digital photographs. The area of necrotic tissue was blindly determined using digitalized images, according to