MIST Therapy® System: Thoughts on Therapy

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CASE SERIES #8

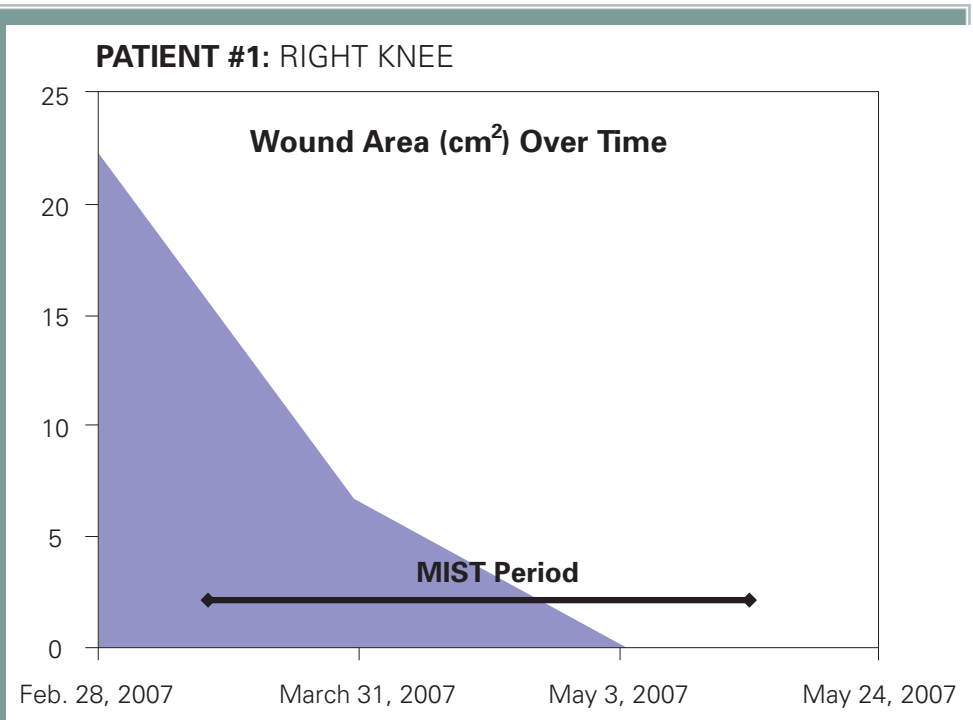
At the Methodist Hospital Wound Clinic (St. Louis Park, Minn), we have been using the MIST Therapy® System (Celleration®, Inc.) since early 2005 to improve tissue quality and promote granulation tissue in chronic, nonhealing wounds. Here, we report the cases of 3 consenting patients for whom we administered MIST Therapy to treat trauma-related wounds complicated by necrosis and undermining.

Necrosis, whether eschar or necrotic slough, impedes the natural course of wound healing by providing a fertile environment for bacterial growth. Furthermore, the necrotic debris itself contributes to wound chronicity by hindering the granulation process, inhibiting the progression of wound contraction, and even leading to undermining by destroying underlying tissues.

The MIST Therapy System is a noncontact, therapeutic ultrasound device approved by the Food and Drug Administration for promoting wound healing through wound cleansing and maintenance debridement by the removal of yellow slough, fibrin, tissue exudate, and bacteria. The low-frequency ultrasound waves of the MIST Therapy System are delivered via a sterile saline mist. Treatments are painless because the device does not contact the wound.

In keeping with the general recommendations provided in the product labeling, we administered MIST Therapy 2–3 times weekly for 2–4 minutes per session. Additionally, all wounds were treated with sharp and/or mechanical debridement and appropriate moist dressings. Wound healing was evaluated on the basis of wound dimensions, undermining, exudate, and tissue characteristics (granulation, slough, or eschar) over time. Wound pain and treatment-related pain were not formally assessed.

PATIENT #1: This 78-year-old female patient presented on February 28, 2007 with a laceration wound on her right knee secondary to a fall. Her medical history included dementia, squamous cell cancer (face), lymphoma, and hemolytic anemia. Concomitant medications consisted of calcium, iron, and folic acid supplements. The wound was necrotic and appeared to have an increased bacterial load, although the wound was not cultured. Although the treating physician recommended suturing, the patient did not seek medical care until it was too late for it to be effective. Therefore, our initial treatment consisted of sharp debridement and wet-to-dry dressings. In an effort to combat necrosis and improve tissue quality, MIST Therapy was initiated on March 9, 2007 and administered 3 times per week for approximately 8 weeks. Initial treatment time of 4 minutes per session was reduced to 3 minutes per session as wound dimensions decreased. The wound was dressed with silver antimicrobial and bacteriostatic dressings and covered with an adhesive foam dressing. On May 10, 2007, after 26 MIST treatments, granulation tissue had formed over 90% of the wound, and MIST Therapy was discontinued. As shown in the table (below), 100% granulation tissue and complete closure were achieved 2 weeks later. The graph (right) illustrates a steep decline in wound area during treatment with MIST Therapy.



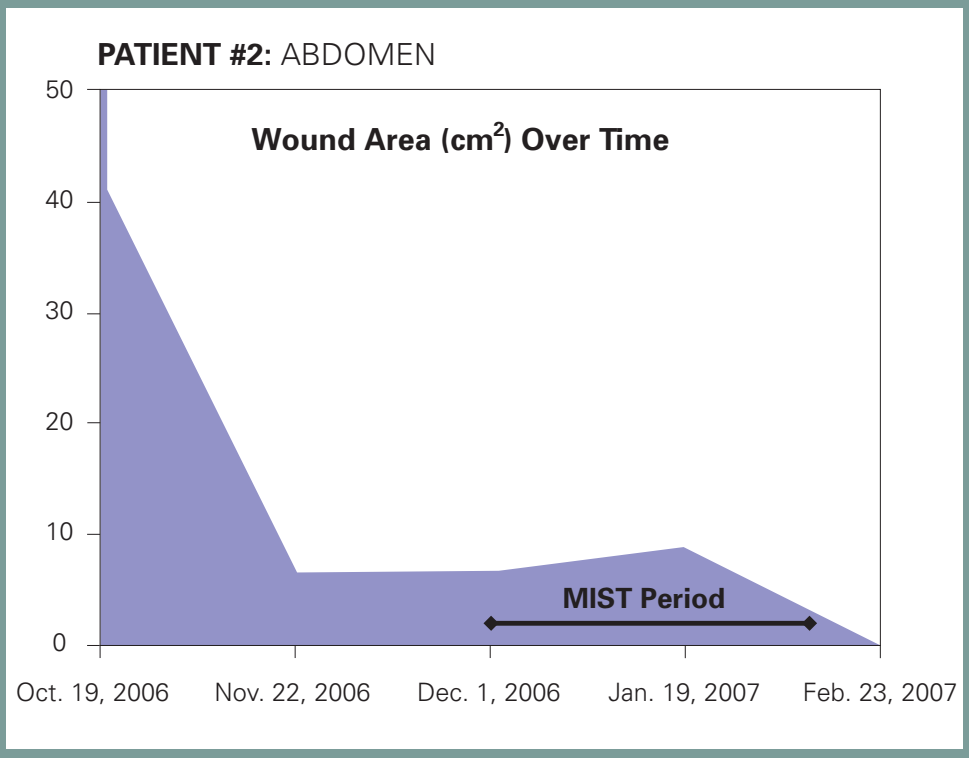
PATIENT #1: RIGHT KNEE								
Time Point	Dimensions (cm)			Undermining (cm)	Drainage	Tissue color (%)		
	Length	Width	Depth			Red/Pink (granulating)	Yellow (slough)	Black (eschar)
2/28/07	11.1	1.9	0.3	0	Moderate	50	50	0
3/31/07	7.5	0.9	0	0	Minimal	75	25	0
5/23/07	0.4	0.5	0.2	0.3 (7:00 —10:00)	Minimal	90	10	0
5/24/07	0	0	0	0	None	100	0	0


3/6/07


4/4/07


5/23/07

PATIENT #2: This 44-year-old female patient had a nonhealing, post-surgical incision wound resulting from an abdominal hysterectomy. Her medical history included conditions known to complicate wound healing, including type 2 diabetes, irritable bowel syndrome, obsessive-compulsive disorder, depression, panic disorder, and a borderline personality disorder. Concomitant medications were omeprazole/sodium bicarbonate, ondansetron hydrochloride, cyclobenzaprine, and quetiapine. Her treatment was further complicated by infection with methicillin-resistant Staphylococcus aureus and undermining at 3:00 (3.0 cm) and 9:00 (3.5 cm). Despite treatment with pulsed lavage, negative pressure wound therapy, and debridement (sharp and mechanical), the wound had failed to close after 2 months of treatment, and undermining continued to be a problem. MIST Therapy was administered 2–3 times per week starting on December 1, 2006, with initial treatment times of 4 minutes per session decreasing to 2 minutes per session as wound size decreased. Dressings consisting of bacteriostatic agents, matrix metalloproteinase-inhibitors, and saline-moistened gauze were administered from the initial evaluation until the wound closed. As shown in the table (below), 100% granulation tissue was achieved and undermining eliminated after 6 weeks of MIST Therapy (January 19, 2007). MIST Therapy was discontinued on January 30, 2007, after a total of 19 treatments, and the wound closed approximately 3 weeks later. As illustrated in the graph (right), the wound area had been declining but had stalled before initiation of MIST Therapy, after which wound area again began to decline toward closure.



PATIENT #2: ABDOMEN

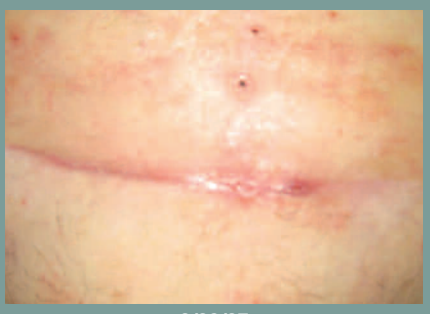
Time Point	Dimensions (cm)			Undermining (cm)	Drainage	Tissue color (%)		
	Length	Width	Depth			Red/Pink (granulating)	Yellow (slough)	Black (eschar)
10/19/06	4.0	10.4	3.0	3.0 (3:00) 3.5 (9:00)	Moderate	30	70	0
11/22/06	1.2	5.6	1.3	1.7 (3:00) 4.5 (9:00)	Moderate	90	10	0
12/1/06	0.8	8.5	0.6	1.0 (3:00) 2.0 (9:00)	Moderate	90	10	0
1/19/07	1.1	8.0	0.5	0	Minimal	100	0	0
2/23/07	0.1	0.1	0	0	None	100	0	0

10/19/06

11/22/06

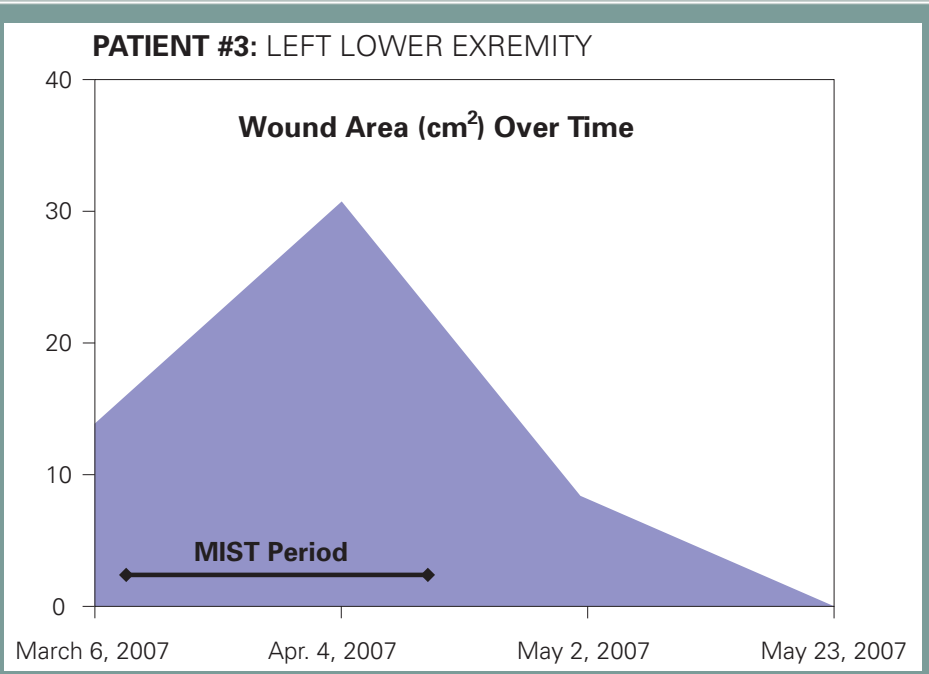
12/1/06

1/19/07



2/23/07

PATIENT #3: This 64-year-old female with hypertension had a traumatic wound of the left lower extremity resulting from a car accident. As shown in the table (below), undermining was present along with copious amounts of necrotic tissue (eschar). Initial treatment with antimicrobial, bacteriostatic, and compression dressings, as well as one pulsed lavage treatment, had failed to make progress on the wound after 6 weeks of treatment. MIST Therapy was initiated 3 times per week for 3–4 minutes per session on March 8, 2007. Antimicrobial, bacteriostatic, and 3-layer compression dressings were continued. After 21 treatments over 7 weeks, MIST Therapy was discontinued on April 27, 2007. Bacteriostatic and foam dressings were continued until the wound reached full granulation. As shown in the table (below), undermining and eschar were eliminated by the May 2, 2007 visit. Three weeks later, 100% granulation tissue was achieved, and the wound was near complete closure, at which time the patient was discharged to home with instructions for standard dressing changes and management. In the graph (above), it is apparent that wound area was beginning to increase again before the start of MIST Therapy,after which wound area eventually began to decline rapidly.

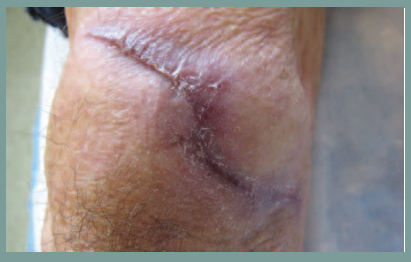


PATIENT #3: ABDOMEN								
Time Point	Dimensions (cm)			Undermining (cm)	Drainage	Tissue color (%)		
	Length	Width	Depth			Red/Pink (granulating)	Yellow (slough)	Black (eschar)
3/6/07	5.2	2.6	0.7	0.5 (1:00), 1.2 (5:00), 1.0 (7:00), 1.9 (9:00) 1.6 (10:00)	None	0	0	100
4/4/07	5.6	5.5	0	1.5 (9:00)	None	30	70	0
5/2/07	3.5	2.4	0	0	None	No measurements		
5/23/07	0.5	0.2	0	0	None	100	0	0


3/6/07


4/2/07


5/3/07


5/24/07

CONCLUSION

In this case series, noncontact ultrasound therapy delivered via the MIST Therapy System aided in the healing of traumatic wounds complicated by necrosis and undermining. These 3 female patients, ranging in age from 44–78 years old, were treated with MIST Therapy 2–3 times per week for 2–4 minutes per session. In these wounds, necrosis and undermining were eliminated, and full granulation was achieved after 7–8 weeks of MIST Therapy.

Other case series have reported the benefits of MIST Therapy in removing necrotic tissue. Our experience suggests that MIST Therapy may also aid the healing process in areas of undermining, where there tends to be more necrotic tissue and more or lingering germ load than in other areas of the wound, resulting in slower development of granulation tissue in undermined areas. We have found that the addition of MIST Therapy appears to speed healing in undermined areas, thus improving the overall rate of healing in wounds with undermining. For example, in the abdominal wound of Patient #2, healing had stalled and undermining persisted despite trying silver, wet-to-dry, and bacteriostatic dressings. With MIST Therapy administered over the intact skin overlying the undermined area, the undermining decreased, and the wound eventually healed.

MIST Therapy appears to have multifaceted effects on the wound healing process by stimulating cells, reducing necrosis and associated bioburden, and helping to eliminate undermining. In comparison, other modalities that we use in our clinic tend to address only some of these barriers to wound healing. For example, we have found that pulsed lavage assists with debridement of necrotic tissue and, though it decreases odor, it does not seem to have as strong a long-term impact on bioburden. MIST Therapy can also be beneficial on wounds that are necrotic but too painful to tolerate pulsed lavage.

In our experience, MIST Therapy appears to offer several benefits that aid in bringing nonhealing, necrotic wounds to closure. We have found it effective for removing the necrotic tissue known to inhibit the body's natural healing process. Even the undermining that developed after necrosis had destroyed underlying tissue resolved with MIST treatment. Perhaps most important are the improvements in tissue quality and the rapid development of granulation tissue, two essential steps in the wound healing process. Although further elucidation is needed regarding the precise mechanisms by which MIST Therapy aids in wound healing, our experience suggests that debridement of necrotic tissue and associated bacteria is a key factor in creating the environment in which tissue repair is possible. ■

Molly Anderson, PT, and Angela Drew, PT, are wound care specialists with the Methodist Hospital Wound Clinic (St. Louis Park, Minn). The authors received no compensation from Celleration®, Inc., for writing this article.