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ORIGINAL RESEARCH

Phytodermatitis due to rare plants: 10 years of experience

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Abstract

We rarely observe instances of phytodermatitis and chemical burns caused by plants. The objective of this study was to assess cases of phytodermatitis in relation to the literature, as early detection is crucial for preventing secondary bacterial infection and hyperpigmentation. This study included 26 patients over the age of 18 who presented to the emergency department with plant-related chemical burns between January 2010 and 31 December 2020. We assessed the demographic and clinical attributes of the patients, as well as the afflicted plant species, wound swab findings, and therapeutic interventions. The study included 26 patients and, mean age was 64.04 $\pm$ 6.46 years, ranging from 52 to 76 years. The average time from plant exposure to hospital admission was 8.85 $\pm$ 4.26 hours. The average hospital stay recovery time for patients was 9.65 $\pm$ 6.67 days. Out of the total cases examined, five (19.2%) were transferred to the burn unit for follow-up, seven (26.9%) to the observation unit of the emergency department, and fourteen (53.8%) to the inpatient services. The patients comprised 9 (34.5%) first-degree cases and 17 (65.5%) second-degree cases. In contrast, 9 patients (34.5 percent) exhibited wound culture findings of development, whereas 17 patients (65.5% of the total) displayed no signs of development. We closely monitored the patients for any detrimental effects throughout the post-discharge three-month period. Out of the total cases, 12 (41.2%) did not experience any challenges, 9 (34.6%) had pigmentation, two had scarring and three required graft application performed by plastic surgeons. While several plant species have beneficial effects on various dermatological and rheumatic conditions, they can also lead to significant adverse reactions. We believe that utilizing contemporary medical practices is the appropriate course of action, as opposed to relying on alternative treatment modalities.

Keywords

Emergency department; Phytodermatitis; Chemical burn; Ranunculaceae; Mandragora

1. Introduction

Notwithstanding advancements in the medical field, alternative treatments continue to gain popularity in all societies, with herbal remedies being among the most frequently employed methods. Examining the mechanisms underlying chemical burns reveals that traditional medicine's use of medicinal botanicals accounts for 4% of reported cases [1]. Topically or systemically, traditional herbal remedies are widely used, particularly among the elderly, with topical application being the most common approach for managing rheumatological conditions [2]. The application of these herbal remedies is gradually expanding beyond the treatment of rheumatic diseases to include cosmetics [2, 3]. Despite the clinical benefits associated with these treatment methods, they may occasionally induce severe adverse effects [4]. According to reports, 33.5% of patients diagnosed with dermatological diseases in Turkey use complementary and alternative medicine [5].

Plants are capable of inducing cutaneous allergies. These reactions manifest themselves in numerous ways. The most prevalent plant reactions include phytophotodermatitis (irritant dermatitis), urticaria (immunological and toxin-mediated), phototoxic dermatitis (phytophotodermatitis) and allergic contact dermatitis. Acute irritant contact dermatitis may develop at the contact site. Plants can cause dermatosis, which we refer to as phytodermatitis. Five distinct models classify phytodermatitis: photophytodermatitis, irritant contact dermatitis, allergic phytodermatitis, pharmacological damage and mechanical damage. Moreover, arthropods or pesticides in plants can cause pseudo-phytodermatitis, and phototoxic chemicals can cause pseudo-photophotodermatitis [6, 7].

Ranunculaceae is a plant species that exhibits spontaneous growth in habitats ranging from 1 to 1850 meters in altitude [8].

The plant, which exhibits growth during the spring and summer seasons, is characterized by its vibrant yellow blossom (Fig. 1) [9].

FIGURE 1. Ranunculus (Mayflower or Butter cup).

The plants in the Ranunculaceae family have the potential to be toxic and irritating because they contain ranunculin. There are approximately 1900 distinct plant species [10, 11]. Ranunculin [6, 12] is also present in species such as Ceratocephalus, Myosurus, Helleborus, Clematis, Ranunculus (R) and Anemone. R. Damascenus is also found in Syria's Damascena region, as well as Turkey's central and southern Anatolian regions [6, 13]. The Far East has traditionally used plants from the Ranunculaceae family to treat conditions like arthritis, asthma, gout, high fever and psoriasis. It is important to note that this plant is highly allergic when it is in the flowering stage [8]. Furthermore, it is widely recognized that this treatment is commonly employed for alleviating joint discomfort, muscular soreness, burns, tears, edema, abscess discharge, hemorrhoids and warts [12]. The Mandragora (M) species, which belongs to the Solanaceae family, possesses sedative, aphrodisiac, emetic, analgesic and anesthetic effects [14].

Mandragora plants, which are indigenous to Central Asia, North India, Southern Europe and the Mediterranean Basin, possess the chemical compounds scopolamine, hyoscyamine and atropine. This particular side effect has the potential to induce life-threatening reactions, multisystemic disorders and severe health complications [15]. Researchers have documented several secondary cutaneous adverse effects, including allergic and irritating contact dermatitis, Stevens-Johnson syndrome, anaphylaxis, photosensitivity and pellagra [16]. Researchers have extracted a total of 80 distinct compounds from several species of Mandragora (Fig. 2) [17].

Because of plant-derived phytodermatitis and irritating contact dermatitis, very few occurrences of chemical burns have been documented in the literature. The objective of this study was to assess the irritative properties of topical herbs often employed in alternative medicine for therapeutic and cosmetic applications.

The literature has documented very few occurrences of chemical burns due to plant-derived phytodermatitis and irritating contact dermatitis. The objective of this study was to assess the irritative properties of topical herbs often employed in alternative medicine for therapeutic and cosmetic applications.

FIGURE 2. Mandragora Radix flower.

2. Material and method

2.1 Study design and population

We conducted this study on 26 patients, aged 18 and above, who suffered chemical burns as a result of using medicinal herbs as an alternative treatment. Cases applied to the emergency department between 01 January 2010 and 31 December 2020 were evaluated. The overall number of incidents remains restricted due to the infrequency of chemical burns caused by medicinal plants, with only a few referred cases to burn centers and dermatology departments. We evaluated cases that recorded demographic data, anamnesis, etiology, lesion location and description, treatment and hospitalization status. Patients under the age of 18 were excluded from the study, as were those with thermal burns, fire and scald burns, and chemical burns generated by non-plant sources. The study also excluded cases that lacked records in the hospital data and archive system. The data forms documented details such as the type of plant, the application site, the purpose of the application, the duration in hours, the age and gender of the patient, the presence of other medical conditions, any complaints related to the application, the results of the physical examination, the hospitalization status, the status of the swab sample for wound culture, the treatment and the duration of recovery in days. The cases' comorbid illnesses included diabetes, hypertension, rheumatic disorders, chronic renal failure and malignancies. The researchers accurately documented their sole comorbid ailment. Nevertheless, cases where two comorbidities were

present were categorized as "both diseases" (*e.g.*, diabetes + hypertension, diabetes + malignancy), whereas cases with three or more comorbidities were categorized as "multiple diseases" (*e.g.*, diabetes + malignancy + rheumatic illness + chronic renal failure). Three categories were identified as reasons for using the plant for therapeutic purposes: alleviating joint pain, treating rheumatic disease, and a third category consisting of those who believe the plant may have beneficial effects on their skin. We further classified the defined information into four distinct classes. The wound severity classification was based on the wound's width. Specifically, wounds measuring 5 × 5 cm were categorized as "mild", wounds measuring between 5 × 5 and 10 × 10 cm were categorized as "middle", and wounds measuring beyond 10 × 10 cm were categorized as "severe". The emergency department treated patients with moderate instances that simply required follow-up. We referred those in the intermediate group and those with unclean wounds to inpatient services. The burn unit received patients with large, dirty wounds that required intervention and had high comorbidities. The classification of burn cases into first and second degrees was based on the extent of the burn surface. We also identified the presence of bacteria in the wound culture. We recommended local, intravenous and oral drug administration. We conducted an evaluation of the patients' scar, graft, pigmentation and symptom-free healing conditions within 3 months of their discharge.

In order to make the identification of the cases easier, patients with first-degree burns smaller than 5 × 5 cm in a single area, with a wound depth limited to the skin and a clean skin wound surface, were defined as "mild". In addition, the second group was defined as "severe", which included wounds with a burn area larger than 5 × 5 cm, more than one wound surface, second-degree burns, wound depth and dirty wounds. We classified the cases as "Body" and "Extremite" based on the location of the wound. Extremities were grouped as right, left and involvement in both.

If patients who applied to the emergency department with complaints of chemical burns brought the plant sample they used, we consulted botanists. If they could not bring the sample, the plant sample was found as described on the internet. After verification, the type of plant was recorded.

2.2 Laboratory design

Patients who presented to the emergency department with a suspected plant-induced chemical burn performed blood sampling for hemogram, biochemistry, lactate and C-reactive protein testing. We collected blood samples from all patients within the first 20 minutes after diagnosis to ensure a specific level of quality.

The patients' lactate levels were measured by analyzing arterial blood gas samples using the Acobas® b221 Blood Gas System (Roche, Basel, Switzerland). We examined the arterial blood gas findings within a time frame of 5 to 10 minutes. The hemogram measurements were determined using the Sysmex DI-60 CBC Analyzer in Istanbul, Turkey. We examined the biochemistry values using the Beckman Coulter Automated AU-680 (Beckman Coulter, Inc., Fullerton, CA, USA). The biochemistry and hemogram blood samples obtained during the initial interview were analyzed and completed within 45–60 minutes.

2.3 Statistical analysis

The data collected from the study were analyzed using the SPSS 20 software package developed by SPSS Inc., based in Chicago, IL, USA. The descriptive statistics included the mean ± standard deviation or median (minimum–maximum) for continuous variables and the number of cases and percentage (%) for nominal variables. Additional data was evaluated using Microsoft Excel and basic descriptive statistics.

3. Results

Out of the 26 patients that participated in the study, 69.2% were women. The study included 18 women and 8 men, with an average age of 64.04 ± 6.46 years and an age range of 52–76 years. The patients obtained treatment at the emergency department due to chemical burns caused by plant usage (Fig. 3).

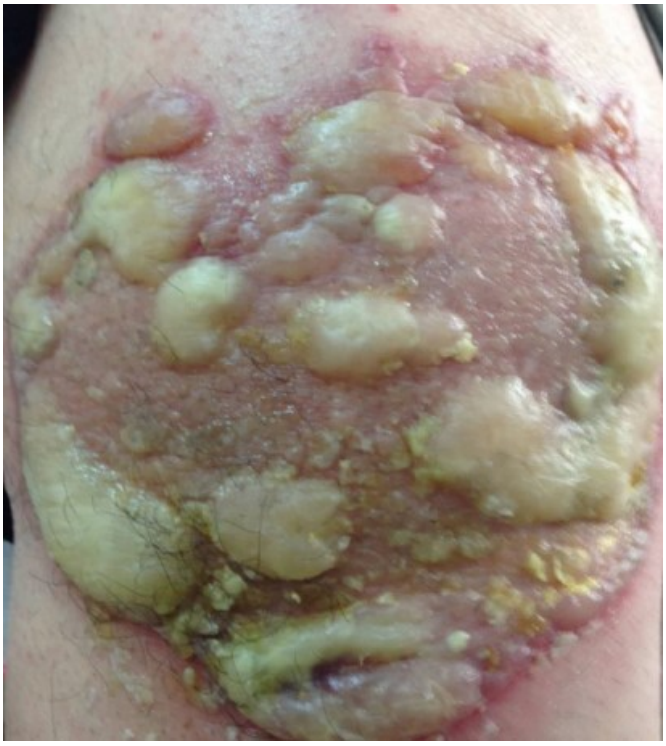

FIGURE 3. Plant-related chemical burns (phytodermatitis).

There was an average interval of 8.85 ± 4.26 hours between the administration of the plant and hospital admission. The mean duration of recuperation for the patients following hospital admission was 9.65 ± 6.67 days. The patients' biochemical parameters included the following: creatinine 1.51 ± 1.10 mg/dL, alkaline phosphatase 110.42 ± 68.12 mg/dL, and C-reactive protein 4.94 ± 2.99 mg/dL. The mean glucose level was measured at 169.38 ± 84.87 mg/dL. We determined that these values exceeded the intended range. The cases revealed a lactate level of 3.66 ± 1.71 mmol/L, which exceeded the established normal range. Other than White Blood Cell (WBC) 12.68 ± 2.78 × 10^3/UL and Basophil 0.46 ± 0.26 × 10^3/UL

being above the normal range, the rest of the values in the patients' hemograms were normal (Table 1).

The location of the cases revealed that 2 (7.7%) were located in the body and 24 (92.3%) in the extremities. Although the majority of patients had one or more comorbid illnesses, 3 patients (11.5%) had none at all. Of them, two (7.7%) had diabetes, two (7.7%) had hypertension, and three (11.5%) had rheumatic disease. Seven patients (26.9%) had two comorbid conditions. Furthermore, there were numerous comorbidities in 9 (34.7%) of the cases. Out of the examined instances, 14 (53.8%) used herbal treatment for joint pain, 9 (34.7%) for rheumatic pain, and 3 (11.5%) for skin health. Out of the patients, 14 (43.8%) received treatment from R. Arvensis, 1 (3.8%) from M. Radix, 3 (11.5%) from R. Kotschyi Boiss, and 8 (30.8%) from R. Damascenus. The emergency department observation unit monitored 7 (26.9%) of the cases, the inpatient services 5 (19.2%), and the burn unit 14 (53.8%). The majority of patients who presented to the emergency department had symptoms such as pain, edema and burns (Table 2). Physical examination revealed a high prevalence of vesiculobullous lesions (Fig. 4).

FIGURE 4. Vesiculo-bullous lesions due to plant use.

Evaluation of the wound size revealed that ten cases (38.4%) had wounds smaller than 5 × 5 cm, eight cases (30.8%) had wounds between 5 × 5 and 10 × 10 cm, and eight cases (30.8%) had wounds larger than 10 × 10 cm. We found that nine patients (34.5%) had first-degree burns, and seventeen (65.5%) had second-degree burns. Wound cultures in 17 (65.5%) cases showed no growth, while nine cases (34.5%) showed growth. Although all cases were treated, three patients received intravenous antibiotics, six received oral antibiotics, and two underwent flap procedures. On the other hand, we implemented local interventions in additional instances. During the 3-month follow-up period following discharge, we detected no complications in 12 (41.2%) of the patients. Plastic surgeons identified pigmentation in 9 (34.6%) patients, detected scarring in two cases, and applied grafts in three cases (Table 3).

4. Discussion

Since antiquity, people have used plants for therapeutic purposes and documented numerous associated adverse effects [18]. Ranunculaceae are herbaceous plants that can be either annual or perennial. Although they often produce vibrant yellow blooms, they occasionally produce white flowers. The flowering period for these plants is generally from April to July. Ranunculaceae, often known as Mayflower or Buttercup, derives its name from its vibrant blossoms that appear during the seasons of spring and summer. During the spring, when the plant is in bloom and has newly emerged leaves, the irritating impact of these plants is most pronounced, and it diminishes when the plant dries out [6, 13]. Every case included in our study occurred only during the spring season, specifically between the months of April and June. The extent of the contact area, the length of the contact, and the quantity of the utilized plant correlate with the magnitude of these effects. Irritation, phototoxicity and hypersensitivity reactions typically lead to the development of the damage, which typically manifests as a chemical burn [19, 20]. Studies have demonstrated that certain species within the Ranunculaceae family possess antiviral, antibacterial, anti-inflammatory and antiprotozoal properties [21–25]. Additionally, it demonstrates an increase in DNA polymerase inhibition and the presence of free oxygen radicals, while also exhibiting antimutagenic and antitumoral properties [10, 26]. The phytochemical investigations of Ranunculaceae species revealed the presence of flavonoids, saponins, alkaloids, free fatty acids, and organic acids [6, 26–28].

Certain species of the Ranunculaceae family possess irritant and poisonous properties as a result of their ranunculin composition. Species such as Ceratocephalus, Myosurus, Helleborus, Clematis, Ranunculus, Damascena and Anemone also contain Ranunculin [6, 12]. When dried, the typical weight of this ranunculin is 10 milligrams per gram [20]. While anemone itself does not have an inflammatory effect, contact with newly crushed flower petals might cause an irritant effect to develop due to the presence of protoanemone. Dried and cooked plants do not contain proto-anemonin [18, 29, 30]. Protoanemonine is a very irritating and volatile oil that stops deoxyribonucleic acid polymerase from working and stops mitosis from happening [18]. This makes more free oxygen radicals. Protoanemone disrupts disulfide bonds and causes the skin layers to separate beneath the outermost layer, resulting in the development of chemical irritant contact dermatitis. Ranuncullaceae can sometimes cause severe vesicles and bullae, resulting in a clinical presentation [8, 13, 31, 32].

There are multiple varieties of Mandragora. Mandragora officinarum is likely the primary cause of the majority of responses, as it is the most prevalent species [33]. As far as we know, there have been two recorded occurrences of allergic contact dermatitis caused by M. radiata. The identity of the reactive ingredient remains unknown due to the isola-

TABLE 1. Basic characteristics and laboratory findings of study patients.

	Phytodermatitis		
	All patient n = 26, n (%) mean ± SD	Wound condition	
		Mild n = 12, n (%) mean ± SD	Severe n = 14, n (%) mean ± SD
Baseline Characteristics			
Age, yr	64.04 ± 6.48	63.83 ± 7.66	64.21 ± 5.56
Sex, Female/Male	18 (69.2)/8 (30.8)	8 (66.7)/4 (33.3)	10 (71.4)/4 (28.6)
Application time (h)	8.85 ± 4.26	8.83 ± 5.76	8.85 ± 2.59
Recovery time (d)	9.65 ± 6.67	6.00 ± 3.07	12.78 ± 7.40
Laboratory finding			
Biochemistry			
Glucose, mg/dL	169.38 ± 84.87	181.16 ± 109.02	159.28 ± 59.63
BUN, mg/dL	54.06 ± 22.57	51.76 ± 25.04	56.02 ± 20.96
Creatinine, mg/dL	1.51 ± 1.10	1.14 ± 0.42	1.83 ± 1.40
AST, mg/dL	33.10 ± 14.23	30.80 ± 17.23	35.00 ± 11.36
ALT, mg/dL	27.31 ± 11.94	25.33 ± 14.05	29.00 ± 10.03
ALP, mg/dL	110.42 ± 68.12	85.58 ± 37.06	131.71 ± 81.88
CK, UL	112.73 ± 56.96	110.33 ± 63.01	114.78 ± 53.57
CKMB, UL	27.08 ± 12.34	26.41 ± 13.44	27.64 ± 11.80
CRP, mg/dL	4.94 ± 2.99	4.58 ± 3.72	5.25 ± 2.30
Lactate, mmol/L	3.66 ± 1.71	3.59 ± 1.93	3.80 ± 1.54
Hemogram			
WBC, 10^3/UL	12.68 ± 2.78	12.67 ± 2.64	12.69 ± 2.98
Neutrophil, 10^3/UL	4.81 ± 1.22	5.03 ± 1.44	4.62 ± 1.02
Lymphocyte, 10^3/UL	2.64 ± 1.01	2.51 ± 0.81	2.53 ± 0.92
Eosinophil, 10^3/UL	0.48 ± 0.35	0.61 ± 0.42	0.38 ± 0.24
Basophil, 10^3/UL	0.46 ± 0.26	0.57 ± 0.31	0.37 ± 0.19
Monocyte, 10^3/UL	0.72 ± 0.21	0.77 ± 0.21	0.67 ± 0.22
MCV, fL	89.59 ± 5.24	89.72 ± 4.60	89.48 ± 5.90
MCH, pg	30.37 ± 1.63	30.55 ± 1.82	30.22 ± 1.49
MCHC, g/dL	32.74 ± 1.12	33.18 ± 0.87	32.64 ± 1.21
RDW, %	14.45 ± 1.20	14.39 ± 1.34	14.50 ± 1.19
MPV, fL	8.33 ± 1.11	8.41 ± 1.54	8.25 ± 0.59

BUN: Blood Urea Nitrogen; AST: Aspartate Aminotransferase; ALT: Alanine Aminotransferase; ALP: Alkaline Phosphatase; CK: Creatine Kinase; CKMB: Creatine Kinase-MB; CRP: C-reactive protein; WBC: White Blood Cell; MCV: Mean Corpuscular Volume; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration; RDW: Red Cell Distribution Width; MPV: Mean Platelet Volume; SD: Standard Deviation.

TABLE 2. Analysis of cases according to localization, accompanying diseases, reasons for using the plant, type of plant and hospitalization status.

Phytodermatitis								
Localization				Additional disease		Reason for application		
Body n (%)	Extremity n (%)			Comorbidity	n (%)	Joint pain n (%)	Rheumatic diseases n (%)	Other n (%)
	Right	Left	Both					
2 (7.7)	4 (15.4)	4 (15.4)	16 (61.5)	No	3 (11.5)	14 (53.8)	9 (34.7)	3 (11.5)
				DM	2 (7.7)			
				HT	2 (7.7)			
				RD	3 (11.5)			
				BD	7 (26.9)			
				MD	9 (34.7)			
Wound condition				Mild (n/%)		Severe (n/%)	Total	
Plant type								
Ranunculus Arvensis				7 (26.9)		7 (26.9)	14 (53.8)	
Mandragora Radix				0		1 (3.8)	1 (3.8)	
Ranunculus Kotschyi Boiss				0		3 (11.5)	3 (11.5)	
Ranunculus Damascenus				5 (19.2)		3 (11.5)	8 (30.8)	
Hospitalization								
Emergency service observation unit				7 (26.9)		0	7 (26.9)	
Inpatient service				5 (19.2)		0	5 (19.2)	
Burn unit				0		14 (53.8)	14 (53.8)	

DM: Diabetes Mellitus; HT: Hypertension; RD: Rheumatic Diseases; BD: Both Diseases; MD: Multiple Diseases.

tion of over 80 distinct compounds from different species of Mandragora [14]. Allergic contact dermatitis in Mandragora species undergoes two distinct phases during its development. The initial phase is known as the afferent phase, during which the drug is in contact and sensitivity develops. We refer to the subsequent phase as the efferent phase, where T cells mediate a delayed hypersensitivity reaction after contact. The afferent phase typically has a duration of 10 to 15 days and is generally without symptoms. The duration of this phase may be short, and allergic contact dermatitis can be triggered in persons who are not already sensitized, even after a single instance of skin contact with a strong hapten. In such instances, the two phases transpire simultaneously in a solitary action [34, 35].

Serial research determined the frequency of phytodermatitis in middle-aged individuals and women. The average age of our cases was 64 years, and 69% of them were female. Doğan *et al.* [31] reported a study with 5 instances, where the mean age was 51 years and 80% of the cases were women. In another study by Kadı *et al.* [11] with 6 cases, the mean age was 58 years, and 67% were women. Calik *et al.* [6] conducted a meta-analysis, revealing that the average age of the participants was 55 years, with 65% being female. Women exhibit a higher propensity than men to utilize alternative medicine, with a likelihood that is twice as high. Furthermore, individuals residing in socio-cultural and economically disadvantaged regions exhibited a greater inclination towards utilizing alternative therapy modalities.

Herbal treatments for draining abscesses, treating bullous lesions, relieving hemorrhoids, healing burns and lacerations, alleviating rheumatic and myalgic discomfort, and managing common colds extensively utilize members of the Ranunculaceae family [8, 13, 36, 37]. In our study, we observed its use in situations where medical interventions, such as for rheumatic pain, myalgia, arthralgia and gonarthrosis, yielded poor results.

In their investigation, Doğan *et al.* [31] found that the degree of chemical burns generated by plants is contingent upon the manner and duration of application. The described cases vary in the timing and characteristics of the lesions. The lesions that can develop after 10 minutes to 48 hours of contact with the irritating plant are primarily in the form of blisters, although they can also advance as strongly defined diffuse red non-blistering forms. The lesions in patients appeared within a time frame of 2–15 hours, with an average start time of 7.54 hours. Furthermore, 54% of the cases exhibited vesiculobullous lesions.

TABLE 3. Analysis of cases according to wound size, burn degree, growth in wound culture, treatment and complications.

Phytodermatitis										
Wound size			Burn degree		Wound culture		Treatment		Conclusion	
Mild n (%)	Middle n (%)	Severe n (%)	First degree burn	Second degree burn	Reproductive	n (%)	Medicine	n (%)	Complication	n (%)
Smaller than 5 × 5 cm	Between 5 × 5–10 × 10 cm	Larger than 10 × 10 cm								
					No	17 (65.5)	Local antibiotic	16 (61.5)	No	12 (41.2)
					PA	2 (7.7)	Oral antibiotic	6 (23.1)	Mortality	0
					CPC	2 (7.7)	Intravenous antibiotic	3 (11.5)	Pigmentation	9 (34.6)
10 (38.4)	8 (30.8)	8 (34.8)	9 (34.5)	17 (65.5)	StP	1 (3.8)	Local steroid	22 (84.6)	Developing scar	2 (7.7)
					SE	1 (3.8)	Local sulfadiazine	2 (7.7)		
					SA	2 (7.7)	Local chlorhexidine	10 (38.4)	Graf applied	3 (11.5)
					MRSA	1 (3.8)	Oral antihistamine	13 (50.0)		
							Flap applied	2 (7.7)		

PA: Pseudomonas Aeruginosa; CPC: Coagulase positive cocci; StP: Streptococcus Pyogenes; SE: Staphylococcus Epidermidis; SA: Staphylococcus Aureus; MRSA: Methicillin-Resistant Staphylococcus Aureus.

R. Arvensis is the most commonly reported species among the Ranunculaceae species, with 15 examples. Other documented species include R. illyricus (3 cases), R. Kotschyi Boiss (6 cases), R. Damascenus (2 cases), R. Constantinopolitus (9 cases), R. Scleratus (1 case), C. Falcatus (9 cases), and C. Testiculatus (1 case) [6]. C. Falcatus, a member of the Ranunculaceae family, caused a burn incident that Kocak *et al.* [8] documented. Doğan *et al.* [31] reported five instances of burns resulting from plants belonging to the Ranunculaceae family, specifically C. falcatus and C. testiculatus. Sinan *et al.* [13] documented a case of chemical burn linked to R. Damascenus. Emsen [38] reported a fatal case of photocontact dermatitis due to the application of Ranunculus, which resulted in local infection and subsequent septic shock. Our analysis revealed that R. Arvensis was the most commonly observed species, with a total of 18 occurrences. In contrast, R. Damascenus was the second most frequently observed species, with just 3 occurrences. We detected growth in nine instances of the swab sample, but no mortality.

Many microorganisms colonize and infect burn wounds due to the loss of the natural skin barrier and disruption of systemic host defensive mechanisms. Until the epithelial tissue fully covers the incision, the patient remains susceptible to invasive infection [39]. Microorganisms like Pseudomonas aeruginosa, Coagulase-positive cocci, Streptococcus pyogenes, Staphylococcus aureus, Methicillin-resistant Staphylococcus aureus, and Staphylococcus epidermidis were grown in the lab from swab samples taken from the burn site. There were no deaths observed in any of our cases. These patients received antibiotics either orally or intravenously. In order to promote healing, it is important to promptly shut off portions of the skin where there is damage. Grafting and topically applying antimicrobial dressings are the most commonly used methods for this purpose, especially during the initial stages. The majority of reported cases revealed the use of antimicrobial dressings for burn wound care. The main agents utilized in this treatment included silver sulfadiazine, fusidic acid, mafenide, nitrofurazone, chlorhexidine, povidone-iodine, mupirocin and others [40]. Our patients received comparable topical therapy. Calik *et al.* [6] reported that they employed wet dressing as the initial therapeutic choice in their therapy.

Benli *et al.* [10] reported natural healing with increased pigmentation on the 15th day following application, without the use of any treatment. Furthermore, there was a report of a patient who showed no response to antibiotic treatment. However, following the application of topical R. Arvensis and topical epithelialization, the patient's treatment continued with a combination of steroid and vaseline. As a result, the postinflammatory hyperpigmentation improved with this treatment [31]. Systemic steroids, systemic antibiotics, and/or surgical techniques can manage untreated postinflammatory hyperpigmentation, resulting in a highly pronounced burn-like appearance [10, 11, 13, 29, 36]. We detected hyperpigmentation in three of our instances. However, two of these cases required graft treatment due to their inadequate response to medicinal treatment. We observed hyperpigmentation and grafts in cases of Pseudomonas aeruginosa, Staphylococcus aureus, Staphylococcus epidermidis, and Methicillin-Resistant Staphylococcus aureus.

5. Conclusions

When medical treatment fails to yield beneficial results, it is customary for patients to utilize naturally sourced herbs for therapeutic objectives. We observe that elderly individuals, especially those living in rural areas, tend to use traditional herbal treatment modalities more frequently. However, it is important to keep in mind that using plants without thinking about their possible side effects or therapeutic dose ranges that haven't been tested in experiments could lead to big problems. More research is needed to determine the efficacy of these herbs, which have a long history of usage in traditional medicine, in the context of complementary medicine.

AVAILABILITY OF DATA AND MATERIALS

All data is available on request without restriction.

AUTHOR CONTRIBUTIONS

AC, BD, BA—concept; MOA, GIO, BA—design; AC, BD, MOA, EF—supervision; AC, SG, GIO—fundings; MOA, AD, BD—materials; AC, BA, AD—data; AC, GIO, AD, EF—analysis; BD, SG, BA, EF—literature search; AC, SGA, GIO, EF—writing, critical revision.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Management of the University of Health Sciences Bagcilar Training and Research Hospital on 04 January 2024, (Approval No: 2024/03/10/034) provided that the consent of the patients and the confidentiality of the data were protected. The study was made in following the Declaration of Helsinki for Human Research. Written informed consent was not necessary because the study was performed retrospectively by screening patient files.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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