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ORIGINAL ARTICLE

CLINICAL AND MORPHOLOGICAL DIFFERENCES BETWEEN KELOID AND HYPERTROPHIC SCARS IN PATIENT TREATED AT KING ABDULAZIZ UNIVERSITY HOSPITAL - JEDDAH

By
Sabah Moshref
Department of Plastic and Reconstructive Surgery, Faculty of Medicine, King Abdulaziz University Hospital, Jeddah, Saudi Arabia

Email: sabahmoshref@hotmail.com

Aim: *Keloid (KD) and Hypertrophic (HS) scars affected patients and frustrated physicians. This study aimed to analyze clinical, anatomical site and specific morphological characteristics of KD and HS scars that might help understanding their pathophysiology and to reach to the appropriate management.*
Methods: *Total of 125 patients [keloid (n=57), hypertrophic (n=63) and combined (n=5) scars] were recruited from Plastic and Reconstructive Surgery unit at King Abdulaziz University Hospital, Jeddah, Saudi Arabia during period (2000-2005). Patients were clinically assessed. Seventy-three KD and 87 HS were evaluated morphologically.*
Results: *Abnormal scars were more in females than males (p<0.01), Saudi than non-Saudi (p<0.05), healthy than with co-morbid patient (p<0.000), brown than white, black colored (p<0.000), patients with negative than positive family history (p<0.000). Commonest age of KD and HS were (20-29 and 10-19 years, respectively). Commonest etiology of keloid, combined keloid and hypertrophic scars was burn while hypertrophic scar was trauma. Commonest symptoms were pruritus. Keloids, hypertrophic scars were mostly single. Commonest site of keloid was chest (21.9%) while for hypertrophy scars were face (26.4%). KD and HS showed different morphological appearance in different anatomical areas. .*
Conclusion: *Keloid and hypetrophic scars are not uncommon in Saudi Arabia. We demonstrated that female, young age, brown color has significant effect on clinical presentation of keloid and hypertrophic scarring.*

Keywords: *Keloid, Hypertrophic scar, morphology, anatomical site.*

INTRODUCTION

Wound healing is a sequential process which results in the production of a healthy scar, the scar then undergoes remodeling by the action of collagenases. Abnormal wound healing were recognized thousands of years ago and have been the subject of the medical literature since 1806 Skin scarring covers a broad spectrum of scars ranging from normal fine line scars to abnormal scars such as stretched scars, scar contractures, hypertrophy scars (HS) and keloid scars (KD) Keloids and hypertrophy scars result from excessive collagen deposition, the cause of which remains elusive. They can result in greatest human deformity, disability, functional and psychological problems which frustrated physicians for centuries. A thorough understanding of the pathophysiology and clinical nature of scar can help in appropriate management.[1-4]

The true incidence and prevalence of keloids are unknown. It is known that their prevalence is equal in male and female. They have been described in all age groups although they tend to occur mainly in those patients with

aged 10 to 30 years and uncommon in very young and elderly, it is more common in darker-skinned patients.[5-7] The common sites of involvement are head, neck, anterior chest wall, shoulders, earlobes, upper arms and cheeks whereas eyelids, genetalia, palms, soles, cornea and mucous membrane are less affected.[7-9] KD appears to be genetically heterogeneous, with both dominant and recessive modes of inheritance.[10] Traumatic factors known to induce keloid are incisions, burns, and infections.[11]

keloid scars are raised in appearance and typically extends beyond the original wound boundaries and spreads by invasion rather than expansion, its onset appear generally at 3 months and can be delayed up to several years after trauma, often resist treatment with tendency to recur after surgical excision, whereas hypertrophic scars remain within confines of original wound, with tendency toward regression, occurs earlier after injury (usually within 4 weeks), more responsive to treatment.[5,12-14] Keloid scar is unique to humans and pathologically, it is a benign dermal fibroproliferative tumor-like lesion that characterized by an excessive accumulation of extra cellular matrix with abundant formation of collagen.[15] KD is a heterogeneous disease, both in terms of its morphology and its clinical behavior. Thus, analysis of its natural history from both epidemiological and pathological points of view becomes important[16,17] This is of particular significance due to the ill-defined treatment of KD despite a range of therapeutic modalities and high rate of recurrence.[3,14]

The aim of this study was to analyze anatomical site, specific morphological characteristics of Keloid and Hypertrophic scars, and their Clinical features (age of onset, cause of scarring, sex and nationality of patients, presence of family and previous medical histories).

PATIENTS AND METHODS

A total of 125 patients with 160 abnormal scars (73 KD and 87 HS) were enrolled in this retrospective study, which was conducted in Plastic and Reconstructive Surgery Unit in King Abdulaziz University Hospital (Jeddah, Saudi Arabia) during the period from 2000 to 2005.

Both clinical and morphological characteristics of scars were evaluated through clinical data and serial photographic follow up. Clinical diagnosis of scar type was based on the following criteria: hypertrophic scar is a raised lesion that remained within the boundaries of original wound, often regressing spontaneously after initial injury and rarely recurring following surgical excision. Whereas, keloid scar is a dermal lesion that spreads beyond the margin of original trauma, continues to grow over time, and does not regress spontaneously, commonly recurring following excision. Accordingly, cases were grouped into KD (n=57) or HS (n=63) or combined scars (n=5). In combined group, both type of scars (KD and HS) were present in the same patient mostly in different anatomical area, with different etiology and morphological characteristics between two scars, so those patients were put as separate group.

The following medical information's were reported for every patient; age, gender, nationality, skin color of patient (black, brown, white) and past medical history (with direct questioning on the following conditions: systemic sclerosis., lung fibrotic disease, Dupuytren's disease, thyroid disease, diabetes, uterine fibroma, peptic ulcer disease, hypertension), past and present drug history, detailed family history of keloid scarring and other fibrotic disorders. Additionally, the following details were recorded for every scar of each individual patient: cause of scaring, duration of disease, and symptoms.

The anatomical regions of the body were divided into 11 areas as following: ear, face, scalp, neck, arm, deltoid region, chest, trunk, pubic mound, leg and foot. The scars are considered single when they found in the same anatomical area and multiple when they found in different anatomical areas. The physical examination of the scar included the following, color (normal, red, hyper pigmented, depigmented), height (raised, slightly raised and flat), surface (smooth, pitted), shape {geometric, (such as ovoid, linear, spheroidal and globular), recognizable (such as butterfly, dumbbell, propeller, petalloid, botryoid and reniform), irregular (nongeometrical and unrecognizable outlines)}, margin (well demarcated, poorly defined), consistency (firm, hard, soft-firm, soft) and sizes (≤1.9 cm2, 2-5 cm2, 6-9and ≥25 cm2) 3,18,19. All adult patients and parents of children patients gave informed consent

Statistical analysis: Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS).

Software version 12.0 for Windows September 2003 (Chicago, USA). Data were represented as number (percentage) or mean ± SD. Calculation of the p value between variable were performing using Person's Chi-squared or one way analysis of variants (ANOVA) tests as appropriate. P-values <0.05 were considered to be significant.

RESULTS

One hundred and twenty five patients with Keloid and hypertrophy scars were involved in this study with their age ranged from 1.3 to 53.0 years (mean ± SD, 20.7±11.2 years). There were significant elevation in percentage of participated females compared to male in studied groups ($p<0.01$), 77 females (61.6%) and 48 males (38.4%). The increase of Saudi compared to non-Saudi was not significant ($p>0.05$), While the increase of healthy (87.2%) compared to those with associated diseases (12.8%), was

significant, (p<0.000), There were significant difference in the colored of the skin and in the presence of negative family history compared to positive family history of related diseases, as showed in Table 1.

Table 2 showed the, most common age groups in keloid were 20 to 29 years (33.3%) and the least age group was ≥ 50 years (3.5%), while in Hypertrophic scars most common age groups were 10 to 19 years (33.3%).

Table 3 showed that the most common etiology in keloid were burn (33.3%) followed by surgical incision (22.8%), trauma (15.8%), infections (10.5%), ear piercing (10.5%), spontaneous (5.3%) and BCG (1.8%). In hypertrophic scars, most common etiology was trauma (34.9%) followed by burn (31.7%), surgical incision (25.4%), infection (6.3%), vaccination and trauma (1.6%), There were no significant difference of duration, etiology and symptoms of the scars between studied group (p>0.05).

Table 4 showed the most common location of keloid single scars were found in chest (24.6%) followed by trunk (14.0%), ear (10.5%), face (10.5%), arm (10.5%), neck (7.2%), deltoid region (7.2%), leg (3.5%), and foot (1.8%). In hypertrophic scar single scars were mostly found in face (33.3%), arm (22.2%), leg (12.7%), trunk (7.9%), neck (4.8%), foot (3.2%), chest (1.6%), and deltoid region (1.6%). There was no significant difference in the number and distribution of the scars between studied groups (p>0.05).

Table 5 showed description of keloid, hypertrophic and combined scars. There were significant difference of color, surface, margin, and consistency of keloid, and hypertrophic scars, between studied groups (p<0.01) .There were no significant difference of height, shape and surface area of scars of the keloid and hypertrophic scars between studied groups (p>0.05).

Table 1. Demographic characteristics of all studied populations.

Variables	Patients (n=125)	Significance
Age (years)		
mean±SD	20.7±11.2	
(range)	(1.3-53.0)	-
Sex [n (%)]		
male	48 (38.4%)	
female	77 (61.6%)	p<0.01
Nationally [n (%)]		
Saudi	76 (60.8%)	
non-Saudi	49 (39.2%)	p<0.05
Medical status [n (%)]		
healthy	109 (87.2%)	
co morbidity	16 (12.8%)	p<0.000
Patient skin color [n (%)]		
black	36 (28.8%)	
brown	79 (63.2%)	
white	10 (8.0%)	p<0.000

Table 2. Demographic characteristics of patients with keloid, hypertrophy and combined scars.

Variables	Type of scar			P value
	Keloid (n=57)	Hypertrophy (n=63)	Combined (n=5)	
Age (years)				
mean±SD	22.8±12.2	18.9±10.2	19.2±10.5	
(range)	(3.0-53.0)	(1.3-47.0)	(8.0-30.0)	
0-9 years [n (%)]	9 (15.8%)	13 (20.6%)	1 (20.0%)	
10-19 years [n (%)]	13 (22.8%)	21 (33.3%)	2 (40.0%)	
20-29 years [n (%)]	19 (33.3%)	20 (31.7%)	-	
30-39 years [n (%)]	10 (17.5%)	7 (11.1%)	2 (40.0%)	
40-49 years [n (%)]	4 (7.0%)	2 (3.2%)	-	
≥50 years [n (%)]	2 (3.5%)	-	-	p>0.05
Sex [n (%)]				
male	20 (35.1%)	28 (44.4%)	-	
female	37 (64.9%)	35 (55.6%)	5 (100%)	p>0.05
Nationally [n (%)]				
Saudi	29 (50.9%)	45 (71.4%)	2 (40.0%)	
non-Saudi	28 (49.1%)	18 (28.6%)	3 (60.0%)	P<0.01
Philippine	3 (5.3%)	-	1 (20.0%)	
Yemeni	13 (22.8%)	8 (12.7%)	1 (20.0%)	
Syrian	2 (3.5%)	2 (3.2%)	-	
Pakistani	3 (5.3%)	3 (4.8%)	-	
Bangladesh	1 (1.8%)	-	-	
Gordian	-	1 (1.6%)	1 (20.0%)	
Indonesian	-	1 (1.6%)	-	
Pernawi	1 (1.8%)	-	-	
Arterian	1 (1.8%)	-	-	
Egyptian	1 (1.8%)	1 (1.6%)	-	
Sudani	3 (5.3%)	1 (1.6%)	-	
Nigerian	-	1 (1.6%)	-	
Medical status [n (%)]				
healthy	47 (82.5%)	58 (92.1%)	4 (80.0%)	
co morbidity	10 (17.5%)	5 (7.9%)	1 (20.0%)	
irregular menses	-	1 (1.6%)	-	
Infertility and	-	-	1 (20.0%)	
hormonal therapy	1 (1.8%)	-	-	
Insulin dependant	1 (1.8%)	-	-	
DM	1 (1.8%)	-	-	
Non insulin	-	1 (1.6%)	-	
dependant DM	-	1 (1.6%)	-	
Hashimotos	1 (1.8%)	-	-	
disease	1 (1.8%)	-	-	
rheumatoid	2 (3.5%)	1 (1.6%)	-	
arthritis	1 (1.8%)	-	-	
chondrosarcoma	2 (3.5%)	1 (1.6%)	-	p>0.05
obesity, hypertension, gynecomasia				
Congenital heart diseases				
bronchial asthma				
Sebaceous cyst				
Dermatitis				
Patient skin color [n (%)]				
black	6 (10.5%)	3 (4.8%)	1 (20.0%)	
brown	33 (57.9%)	45 (71.4%)	1 (20.0%)	
white	18 (31.6%)	15 (23.8%)	3 (60.0%)	p>0.05
Family history [n (%)]				
yes	5 (8.8%)	2 (3.2%)	1 (20.0%)	
no	52 (91.2%)	61 (96.8%)	4 (80.0%)	p>0.05

% to number of patients in diseased group.

Table 3. Clinical features of keloid, hypertrophy and combined scars.

Variables	Type of scar				P value
	Keloid (n=57)	Hypertrophy (n=63)	Combined (n=5) Keloid	Hypertrophy	
Scar duration (years) [mean±SD]	4.0±4.2	6.1±7.3	4.0±4.2	6.1±7.3	
(range)	(0.2-21.0)	(0.1-30.0)	(8.0-35.0)	(8.0-35.0)	
≤ 6 months	6 (10.5%)	12 (19.0%)	-	-	
7-11 months	5 (8.8%)	4 (6.3%)	-	-	
1-2 years	18 (31.6%)	16 (25.4%)	2 (40.0%)	2 (40.0%)	
3-5 years	15 (26.3%)	6 (9.5%)	1 (20.0%)	2 (40.0%)	
6-10 years	9 (15.8%)	13 (20.6%)	1 (20.0%)	1 (20.0%)	
11-20 years	3 (5.3%)	9 (14.3%)	1 (20.0%)	-	
≥21 years	1 (1.8%)	3 (4.8%)	-	-	p>0.05
Scar etiology [n (%)]					
burn	19 (33.3%)	20 (31.7%)	2 (40.0%)	2 (40.0%)	
infections	6 (10.5%)	4 (6.3%)	-	2 (40.0%)	
trauma	9 (15.8%)	22 (34.9%)	-	-	
surgical incision	13 (22.8%)	16 (25.4%)	-	1 (20.0%)	
BCG	1 (1.8%)	-	-	-	
ear piercing	6 (10.5%)	-	2 (40.0%)	-	
spontaneous	3 (5.3%)	-	-	-	
vaccination & trauma	-	1 (1.6%)	1 (20.0%)	-	p>0.05
Symptoms [n (%)]					
asymptomatic	17 (29.8%)	32 (50.8%)	2 (40.0%)	3 (60.0%)	
symptomatic	40 (70.2%)	31 (49.2%)	3 (60%)	2 (40.0%)	
pain	-	1 (1.6%)	-	-	
itching	28 (49.1%)	13 (20.6%)	2 (40.0%)	1 (20.0%)	
contracture	10 (17.5%)	2 (3.2%)	1 (20.0%)	1 (20.0%)	
pain and itching	1 (1.8%)	7 (11.1%)	-	-	
itching and contracture	1 (1.8%)	3 (4.8%)	-	-	
pain, itching, contracture	-	5 (7.9%)	-	-	p>0.05

% to number of patients in diseased group.

Table 4. Anatomical location and numbers of keloid, hypertrophy and combined scars.

Variables [n (%)]	Type of scar				P value
	Keloid (n=57)	Hypertrophy (n=63)	Combined (n=5) Keloid	Hypertrophy	
Scar numbers					
single	51 (89.5%)	55 (87.3%)	4 (80.0%)	3 (60.0%)	
multiples	6 (10.5%)	8 (12.7%)	1 (20.0%)	2 (40.0%)	
2 anatomical area	3 (5.3%)	3 (4.8%)	1 (20.0%)	-	
3 anatomical area	2 (3.5%)	4 (6.3%)	-	1 (20.0%)	
4 anatomical area	1 (1.8%)	1 (1.6%)	-	1 (20.0%)	p>0.05
Anatomical locations					
Scars in Single area					
ear	6 (10.5%)	-	2 (40.0%)	-	
face	6 (10.5%)	21 (33.3%)	-	-	
neck	4 (7.2%)	3 (4.8%)	-	-	
arm	6 (10.5%)	14 (22.2%)	-	1 (20.0%)	
deltoid region	4 (7.2%)	1 (1.6%)	1 (20.0%)	-	
chest	14 (24.6%)	1 (1.6%)	-	-	
trunk	8 (14.0%)	5 (7.9%)	-	1 (20%)	
leg	2 (3.5%)	8 (12.7%)	1 (20.0%)	1 (20.0%)	
foot	1 (1.8%)	2 (3.2%)	-	-	
Scars in multiple areas					
Face& neck	-	1 (1.6%)	-	1 (20.0%)	
neck & leg	-	1 (1.6%)	-	-	
arm & leg	1 (1.8%)	-	-	-	
arm & deltoid region	1 (1.8%)	-	-	-	
arm & ear	1 (1.8%)	-	-	-	
deltoid region & leg	-	1 (1.6%)	-	-	
chest & trunk	-	-	1 (20.0%)	-	
chest, leg & foot	2 (3.5%)	-	-	-	
arm, trunk & leg	-	2 (3.2%)	-	-	
neck, deltoid region & arm	-	1 (1.6%)	-	-	
trunk, leg & pubic mound	-	1 (1.6%)	-	-	p>0.05
arm, trunk, pubic mound & leg	-	1 (1.6%)	-	1 (20.0%)	
face, chest, trunk & leg	1 (1.8%)	-	-	-	

% to number of patients in diseased group.

Table 5. Description of keloid, hypertrophy and combined scars.

Variables	Type of scar				P value
	Keloid (n=57)	Hypertrophy (n=63)	Combined (n=5) Keloid	Hypertrophy	
Color of scar [n (%)]					
normal	14 (24.6%)	13 (20.6%)	2 (40.0%)	2 (40.0%)	
red	29 (50.9%)	19 (30.2%)	-	-	
hyperpigmented	12 (21.1%)	25 (39.7%)	2 (40.0%)	2 (40.0%)	
depigmented	2 (3.5%)	6 (9.5%)	1 (20.0%)	1 (20.0%)	**p<0.01**
Height of scar [n (%)]					
Raised	29 (50.9%)	19 (30.2%)	3 (60.0%)	2 (40.0%)	
Slightly raised	25 (43.9%)	32 (50.8%)	1 (20.0%)	2 (40.0%)	
flat	3 (5.3%)	12 (19.0%)	1 (20.0%)	1 (20.0%)	p>0.05
Surface of scar [n (%)]					
smooth	32 (56.1%)	53 (84.1%)	3 (60.0%)	5 (100.0%)	
pitted appearance	25 (43.9%)	10 (15.9%)	2 (40.0%)	-	**p<0.01**
Shape of scar [n (%)]					
geometric	36 (63.2%)	29 (46.0%)	3 (60.0%)	3 (60.0%)	
irregular	10 (17.5%)	16 (25.4%)	2 (40.0%)	2 (40.0%)	
recognizable	11 (19.3%)	18 (28.6%)	-	-	p>0.05
Margin [n (%)]					
well demarcated	8 (14.0%)	59 (93.7%)	1 (20.0%)	5 (100.0%)	
poorly defined	49 (86.0%)	4 (6.3%)	4 (80.0%)	-	**p<0.000**
Consistency [n (%)]					
firm	42 (73.7%)	25 (39.7%)	5 (100%)	2 (40.0%)	
hard	8 (14.0%)	2 (3.2%)	-	-	
soft-firm	6 (10.5%)	31 (49.2%)	-	3 (60.0%)	
soft	1 (1.8%)	5 (7.9%)	-	-	**p<0.000**
Surface area of scar (cm^2) (range)	5.8±6.6	5.9±6.4	6.9±12.9 (0.5-30.0)	8.6±12.1	
≤1.9 mm^2	(0.6-35.0)	(0.5-30.0)	3 (60.0%)	(0.5-30.0)	
2-5 mm^2	8 (14.0%)	3 (4.8%)	1 (20.0%)	1 (20.0%)	
6-9 mm^2	33 (57.9%)	41 (65.1%)	-	3 (60.0%)	
≥10 mm^2	8 (14.0%)	10 (15.9%)	1 (20.0%)	-	
	8 (14.0%)	9 (14.3%)		1 (20.0%)	p>0.05

% to number of patients in diseased group.

DISCUSSION

Keloids and hypertrophic scars represent an aberration in fundamental processes of wound healing, and although it was thought that they both are different expressions of the same derailed wound healing process, successful treatment of hypertrophic scars is much easier to achieve than in keloids.[20,21] Several morphologic and immunohistochemical differences between both scar types were found that support the suggestion that different mechanisms are responsible for their development.[22] Therefore, it is important to differentiate between both scar types during research to understand their pathogenesis and to find a better treatment. The keloids and hypertrophic scars are not uncommon disease in Saudi Arabia. The greater cosmetics and symptomatic impacts on the patients necessitate good study of its different aspects.

keloids have been noted in all age groups, ,and most commonly in the second to fourth decades of life. , this is in consistence with our finding where age range of keloid was (3.0-53.0 years) with most common age range for keloid was (20-29 years).[23,24] In this respect, it had been previously reported that A possible explanation for greater

incidence in younger age group could be their increased predisposition to trauma.[25] A hormonal influence was suggested as cause of keloids, because they often appear at puberty, resolve after menopause, and enlarge during pregnancy.[6,26] Patients with acne keloidalis, for example, proved to have a significant higher serum testosterone.[27,28]

Hypertrophic scar have been noted in the range of (1.3-47.0 years) with most common age range was (10-19 years). The percentage of participated female were significantly higher than male in this study but this difference does not reach statistical significant level. Other literatures, found that gender distribution of keloid patients was almost equal between males and females although some authors describes female predominance.[10,24,29,30]

Comparable incidence ratios of keloid for the races vary from 5.1 to 15.1. The incidence of hypertrophic scars is possibly higher than that of keloids, but good data are lacking.[29] In this study the incidence of keloid and hypertrophic scars were more in brown followed by white and lastly in black colored skin patients, Table 1. These results were contrast with the others who reported that incidence of fifteen to one keloids in the black compared to white population.[17,30] This difference may be due to high incidence of brown and low incidence of black colored skin people lived in Saudi Arabia.

Some cases of keloid suggest familial predisposition. In this study positive family history of similar related condition was reported in 8.8% of keloid and 3.2% of hypertrophic scar patients. Previously, family history had been reported in patients with keloid in a range between 5% and 10% in a white population. Sharquie and Al-Dhalim found positive family history in 16% of their keloid patients.[24,31,32] Keloids and hypertrophic scars may follow wounds from different etiology. The most important risk factor is wound healing by secondary intention, especially if healing time is greater than 3 weeks. Tension may play role in Keloid development. Therefore many surgeons stress the importance of minimizing tension across a wound in a patient predisposed to keloid or hypertrophic scarring.[23,33]

Several types of skin injury including surgery, piercing, burns, lacerations, abrasions, tattoo placement, vaccinations, insect bites, and any inflammatory process such as acne, varicella, or folliculitis, which can induce keloid, this is in consestant with our results were we found that most common etiology for keloid scars was burn (33.3%) followed by surgical incision (22.8%), trauma (15.8%), infections (10.5%), ear piercing (10.5%), BCG vaccination (1.8%), while spontaneous scars was found in (5.3%).[10,16,24,34] In consistence with ours there have been a number of reports that KD may develop spontaneously in susceptible individuals.[12,24,35] Also this study revealed that most common cause of keloid scars, in ear was ear piercing; Bayat et al., found laceration, followed by piercing and acne, to be most common causes of keloid scarring.[16]

Hypertrophic scars were most commonly caused by trauma (34.9%) followed by burn (31.7%), surgical incision (25.4%), infection (6.3%), vaccination (1.6%) and trauma. (1.6%), In this respect, others reported that incidence of hypertrophic scarring is about 39% to 68% after surgery and 33% to 91% after burns, depending on depth of the wound.[36,37]

Keloid and hypertrophic scars had a greater cosmetics impact on the affected patients In agreement with others, itching was the most common symptoms in both types of scars among studied patients. This might be related to the presence of mast cells and other inflammatory cells.,Other symptoms reported in this study were pain, contracture.[24,32]

A keloid may occur anywhere on the body with morphologies are specific to each anatomic site, although certain areas of the body show increased susceptibility.[14,34,35,38] Their regional susceptibility is unexplained: the anterior chest, shoulders, earlobes, upper arms, and cheeks have a higher predilection for keloid formation, whereas eyelids, genitalia, palms, soles, cornea, and mucous membranes, are less affected.[9,39] In this series, most common site of keloid In single scars were mostly found in chest (24.6%) followed by trunk (14.0%), ear (10.5%), face (10.5%), arm (10.5%), neck (7.2%), deltoid region (7.2%), leg (3.5%), foot (1.8%), While hypertrophic scars single scars were mostly found in face (33.3%), arm (22.2%), leg (12.7%), trunk (7.9%), neck (4.8%), foot (3.2%), chest (1.6%), deltoid region (1.6%) In consistence with our results, Ramakrishnan et al.[26] reported chest and trunk to have a higher incidence of keloid scarring than ear. while, others,[40] found that ear lobe to be most common location for keloid scar development followed by anterior chest, deltoid and upper back.[16,30,35,40]

In this study, colors of scars were different from normal to red, hyperpigmented and depigmented. Color of keloid scars were mostly red while hypertrophic scars were mostly hyperpigmented. Most reported keloids and hypertrophic scars were raised above the surrounding surface. In this respect previous study reported that keloids usually project above surrounding skin[34] while hypertrophic scars rarely elevated more than 4 mm above surrounding surface.[41] Surface appearance were more smooth in hypertrophic scars while in keloids it was either smooth or pitted. Shape of both Keloid and Hypertrophic scars were ranged from geometric, recognizable and irregular.[4].Most of scars reported in this study was geometric in shapes. In this study, we demonstrated

phenotypic variations in keloid and hypertrophic scars in different anatomical locations. The varying clinical behavior of keloid scars in different anatomical sites may be influenced by the observed differences in scar morphology in different individuals.

In conclusion Keloid and Hypertrophic scars are not uncommon in Saudi Arabia. Scars with morphologically similar appearances may behave differently depending on their specific anatomical location. At the same time, keloid and hypertrophy scars with morphologically dissimilar appearances may also behave differently even if present on the same anatomical location. In this particular study group, we have demonstrated that female sex, younger age at onset, brown color skin have a highly significant effect on the clinical presentation of keloid scarring in the Saudi Arabia. These observations also may be indicative of a genetic basis to keloid scarring which emphasizes the need for genetic studies in Keloid scars to develop future diagnostic and therapeutic regimes. Knowledge of these variations may enable prediction of the keloid scar's behavior in response to treatment and prognosis.

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