Title:

The Skin–Heart Connection:
Diagnostic Value of Cutaneous Signs in Cardiovascular Disease

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Abstract
Cutaneous manifestations often serve as subtle yet critical indicators of underlying cardiovascular disease. Despite their accessibility and visibility, these signs are frequently underutilized in clinical cardiology, especially in cases where cardiac symptoms are vague or absent (1,2). The skin, our largest organ, can reflect systemic dysfunction often revealing signs of cardiovascular disease before overt clinical manifestations emerge. The growing field of cardiodermatology highlights the diagnostic and prognostic value of recognizing specific dermatologic findings in cardiovascular care (1,2,5). The spectrum of cutaneous involvement is broad, from embolic lesions observed in infective endocarditis to stasis-related changes in heart failure and ischemic skin signs in peripheral arterial disease. Additionally, chronic inflammatory dermatoses such as psoriasis and hidradenitis suppurativa have emerged as independent risk factors for cardiovascular disease, underscoring the importance of interdisciplinary awareness (1,3,4,5). Integrating dermatologic assessment into routine cardiovascular evaluation may offer earlier detection, improved risk stratification, and ultimately, better clinical outcomes (1,2,5). This review outlines the close relationship between dermatology and cardiovascular medicine, highlighting key cutaneous findings across major cardiovascular conditions and the importance of interdisciplinary collaboration in managing cardiovascular patients:

<u>Infective Endocarditis: Cutaneous Red Flags</u>
Janeway lesions (non-tender erythematous macules on palms/soles) and Splinter hemorrhages (linear streaks under the nails), though rare, possess high diagnostic specificity for Infective Endocarditis (IE) systemic embolization and should prompt urgent echocardiographic evaluation (3,6,7). Osler nodes, painful subcutaneous nodules, are attributed to immune complex deposition and vasculitis in IE. Purpura in IE arises from multiple mechanisms, including septic microemboli from cardiac vegetations causing small vessel occlusion and inflammation, or immune complex–mediated leukocytoclastic vasculitis (3, 6,7). Purpura is recognized as a minor diagnostic criterion in the Modified Duke Criteria and correlates clinically with larger vegetations and an increased risk of embolic complications (8).

<u>Cholesterol Embolization Syndrome: Livedo Reticularis</u>
Livedo reticularis, characterized by a violaceous, net-like rash, can manifest in cholesterol embolization syndrome (CES) and severe valvular diseases, especially aortic stenosis (3,7). In CES, this skin pattern arises due to cholesterol crystal-induced blockage of small dermal arteries, causing localized ischemia

and producing the distinctive reticular appearance (3,7). This syndrome most frequently develops following vascular procedures such as angiography or vascular surgery. Still, it may occur spontaneously or after anticoagulation or thrombolytic treatment in individuals with advanced atherosclerosis (9).

Heart Failure: Dermatologic Markers of Chronic Decompensation (Stasis and Hypoperfusion)

Chronic and decompensated heart failure (HF) is associated with a constellation of skin changes, including peripheral cyanosis, digital clubbing, and stasis dermatitis. Peripheral cyanosis, indicative of systemic hypoperfusion, manifests as a bluish discoloration of the lips or distal extremities (7, 9,10). Clubbing, though more common in pulmonary disease, may arise in advanced HF due to chronic hypoxia (7). Stasis dermatitis results from venous hypertension and presents with hyperpigmented, eczematous patches and edema on the lower extremities, frequently complicated by ulceration and secondary infection in immobile or elderly patients (7,10).

Peripheral Artery Disease: Ischemic Indicators in the skin

In peripheral artery disease (PAD), dermatologic changes often precede symptomatic claudication. Early signs such as pallor, cool extremities, hair loss, and shiny, atrophic skin reflect chronic ischemia (11,12,13). More advanced presentations include non-healing ulcers, dry gangrene, and delayed capillary refill, which aid in diagnosis and carry prognostic value. Recognition of these signs should prompt vascular studies such as ankle-brachial index measurement and Doppler imaging (11,13).

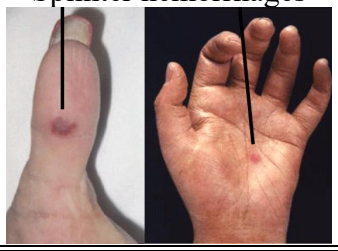
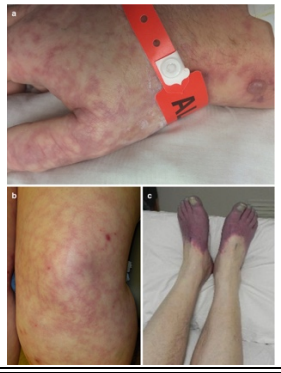
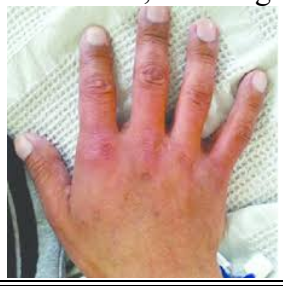
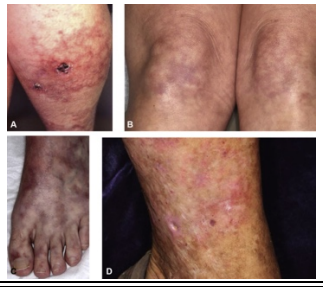
Inflammatory Dermatoses and Cardiovascular Risk

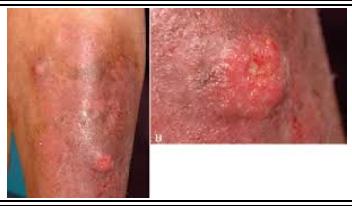
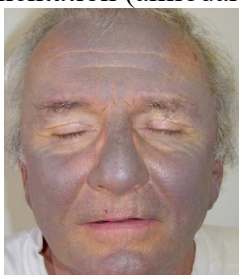
Chronic inflammatory skin diseases are increasingly recognized as independent risk factors for atherosclerotic cardiovascular disease. Psoriasis is associated with systemic inflammation, endothelial dysfunction, and heightened risk of myocardial infarction and stroke (1,4,14). Similarly, hidradenitis suppurativa, characterized by recurrent nodules and abscesses in apocrine-rich areas, has been linked to metabolic syndrome and cardiovascular morbidity (4,14). These associations are mediated through shared inflammatory pathways, involving cytokines such as TNF-α and IL-6, and underscore the need for proactive cardiovascular risk screening in affected patients (1,14).

Dermatologic Side Effects of Cardiovascular Drugs

In addition to primary cutaneous manifestations of cardiovascular diseases, various cardiovascular medications themselves can induce significant skin reactions that require careful monitoring, as they can impact patient adherence to treatment and quality of life. Photosensitivity, hyperpigmentation, and eczematous eruptions are among the most frequently encountered cutaneous adverse effects. Amiodarone, for example, is well known to cause photosensitivity and distinctive blue-gray hyperpigmentation (15). Chronic use of certain antihypertensives, especially thiazides, has also been linked to an increased risk of non-melanoma skin cancers, likely due to their photosensitizing properties (16). Beyond these, other cardiovascular agents such as beta-blockers, ACE inhibitors, and statins can provoke a range of cutaneous reactions, including urticaria, angioedema, lichenoid eruptions, and in rare cases, Stevens-Johnson syndrome (16).

Summary Table: Key Cutaneous Findings in Cardiovascular Disease

Cardiovascular Condition	Key Skin Manifestation	Pathophysiology	Diagnostic Importance	Clinical Implication
Infective Endocarditis	Janeway lesions, Osler nodes, Splinter hemorrhages 	Septic emboli and immune-mediated vasculitis	Highly specific for systemic embolism	Urgent echocardiography and antibiotic therapy
Cholesterol Embolization Syndrome	Livedo reticularis 	Cholesterol crystal emboli blocking dermal vessels	Suggests cholesterol embolization	Evaluate vascular status; manage risk factors
Heart Failure	Peripheral cyanosis, stasis dermatitis, clubbing 	Hypoperfusion, venous stasis, chronic hypoxia	Indicates advanced heart failure status	Optimize cardiac function; prevent skin complications
Peripheral Artery Disease	Cool, pale skin; hair loss; ulcers 	Chronic ischemia from arterial obstruction	Early indicator of PAD	Vascular assessment and revascularization
Psoriasis & Hidradenitis	Psoriatic plaques, recurrent nodules	Chronic systemic inflammation affecting endothelium	Marker of increased cardiovascular risk	Screen for cardiovascular comorbidities

Cardiovascular Condition	Key Skin Manifestation	Pathophysiology	Diagnostic Importance	Clinical Implication
				
Cardiovascular Medications	Photosensitivity, blue-gray pigmentation (amiodarone) 	Drug-induced cutaneous adverse effects	May impair treatment adherence	Monitor skin reactions; adjust therapy if needed

Images Source, in order of appearance:

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Conclusion

Cardiodermatology, an emerging interdisciplinary field, plays a crucial role in bridging the gap between dermatology and cardiovascular medicine. Dermatologic manifestations offer a unique, visible insight into cardiovascular pathology. Recognizing these signs, whether specific, such as Janeway lesions in endocarditis, or nonspecific, like stasis dermatitis in heart failure, can facilitate early diagnosis and targeted evaluation. Routine integration of skin assessment into cardiovascular care can enhance diagnostic precision, early intervention, and improve long-term health outcomes.

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