
Cellulite: Classification and Scoring

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Abstract

Cellulite is a very common clinical condition, more commonly presenting on the buttocks, lower limbs, and abdomen. Cellulite classification and scoring is of great relevance to accurately follow up treatment out-comes. The Cellulite Severity Scale (CSS) is a validated comprehensive objective method of measuring cellulite. It is an alpha-photonumeric scale and considers five important clinical and morphological aspects involved in cellulite. Its main advantage is that it can indicate which morphological aspect is the most significant component of cellulite for each patient, allowing the physician to determine the most suitable treatment for the patient.

Keywords

Cellulite • Classification • Depression-Flaccidity • Laxity • Measuring • Photonumeric • Scale • Scoring • Skin surface alteration • Validated • Validation

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1 Introduction and Definition

Cellulite is a very common clinical condition in which there is modification of skin topography evident by skin dimpling and nodularity, giving an orange peel, cottage cheese, or mattress aspect to the skin (Segers et al. 1984; Scherwitz and Braun-Falco 1978; Hexsel et al. 2009a; Khan et al. 2010), more commonly presenting on the

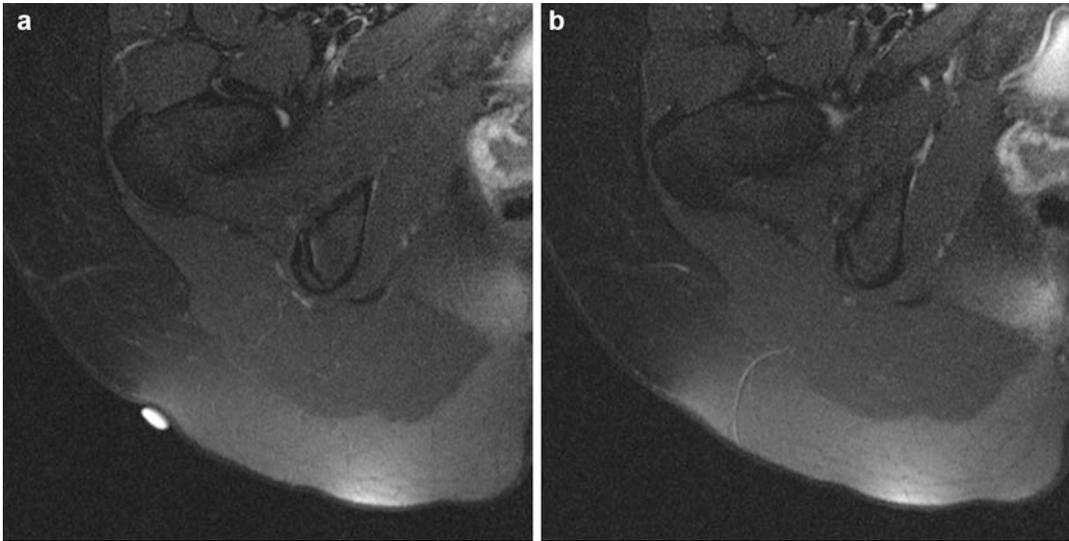


Fig. 1 Sequence of magnetic resonance imaging of a patient in an area with a cellulite depression. The first slice (a) shows a skin marker identifying the cellulite

depression. The second slice (b) shows typical, thicker, ramified, and perpendicular fibrous septum

buttocks, lower limbs, and abdomen. It is a localized metabolic and a complex architectural multifactorial disorder of the subcutaneous tissue (Hexsel et al. 2009a; Khan et al. 2010). This condition can be found in different age groups and in both sexes, but the prevalence is higher in females after puberty and in obese patients, being reported as a normal manifestation of obesity (Hexsel and Mazzuco 2000). On the other hand, cellulite is also present in nonobese individuals (Hexsel et al. 2009a; Khan et al. 2010).

The pathophysiology of cellulite is complex, and there are many theories to elucidate it. The majority of the theories involve alterations to the adipose tissue and microcirculation causing fibrosclerosis of the connective tissue. It is considered a noninflammatory, degenerative condition, producing alterations to the hypodermis producing irregular undulations on the skin overlying the affected areas (Hexsel et al. 2010).

Differences in subcutaneous tissue architecture between men and women may explain the female sex predominance of this condition (Nürberger and Müller 1978). In women, bands of connective tissue are oriented radially or perpendicular to the skin surface (Nürberger and Müller 1978; De la Casa et al. 2012). As the fat layer expands,

herniation of subcutaneous fat within fibrous connective tissue occurs, leading to a puckered appearance of the skin (Querleux et al. 2002; Piérard et al. 2000). In men, these septa adopt an oblique zigzag pattern, which holds the fat layer and prevents the projection of the adipose tissue on the skin surface (De la Casa et al. 2012; Querleux et al. 2002; Piérard et al. 2000) (Fig. 1).

The skin surface alterations are comprised of depressed and raised areas, compared to normal adjacent skin. Depressed lesions occur due to the presence of fibrous septa that pull the skin surface down, and raised areas are the projection of underlying fat to the skin surface (Hexsel et al. 2009a). Recent studies have shown the anatomic structures involved in cellulite. One of those studies utilizing MRI analysis concludes that cellulite depressions on the buttocks are associated with the presence of underlying fibrous septa, (Hexsel et al. 2009b) which pulls the skin surface down, projecting the underlying fat to the skin surface and resulting in the raised areas (Hexsel 2001). It was found that all fibrous septa in the examined areas were perpendicular to the skin surface and most of them were ramified (Hexsel et al. 2009a).

Despite the morphological basis which explains the clinical presentation of cellulite, the

Table 1 Classification of cellulite based on clinical criteria (Piérard et al. 2000)

Grade or stage	Clinical characteristics
0 (zero)	Skin surface is smooth
I	The skin surface is smooth while the subject is standing or lying, but the alterations to the skin surface can be seen by pinching the skin or with muscle contraction
II	The orange skin or mattress appearance is evident when standing, without the use of any manipulation (skin pinching or muscle contraction)
III	The alterations described in grade or stage II are present together with raised areas and nodules

pathophysiology of cellulite is still not fully elucidated. It seems to be a physiological phenomenon or at least that it has a physiological origin (De la Casa et al. 2012). It is a multi-causal disorder, with the coexistence of a number of factors that trigger, perpetuate, or exacerbate it (De la Casa et al. 2012). Flaccidity, laxity, or sagging of the skin further aggravates morphological alterations in the majority of patients (Hexsel et al. 2009a). Minor factors, such as weight gain or loss, localized tissue vascularity and postinflammatory changes, hormonal and genetic influences, and lifestyle, may also have an important role in cellulite's pathogenesis (Khan et al. 2010).

With the purpose of measuring cellulite severity and the effects of treatment modalities, a comprehensive objective method of measuring cellulite was developed and is presented in this chapter, the new *Cellulite Severity Scale* (CSS) (Hexsel et al. 2009a). It considers important clinical and morphological aspects involved in the cellulite for its classification.

2 Classification and Scoring

Cellulite classification and scoring is of great relevance to accurately follow up treatment outcomes. This is also important to determine the more appropriate treatment for each patient. The evaluation of a patient with cellulite is mostly performed with clinical examination, and two classifications have already been developed aiming to determine different degrees of this condition. Cellulite must be evaluated with patients in standing position with relaxed muscles, so as to correctly identify the depressed and raised lesions

of cellulite that are clearly apparent, regardless of pinch test or muscular contraction (Hexsel and Mazzuco 2000).

Nürnbergger and Müller (1978) have described the most widely used classification until the last few years. They classified cellulite in degrees 0 to III, which varied from the complete absence of cellulite to its occurrence in a more severe degree (Table 1). A pinch test can be done to make the lesions more evident or to differentiate grades 0 from I.

Although largely used and practical, the abovementioned classification does not comprise all important additional morphologic aspects of cellulite and, thus, is not comprehensive enough to identify individual needs for treatment and to evaluate different treatment responses. Aiming to fulfill this gap, Hexsel, Dal'Forno, and Hexsel published the *Cellulite Severity Scale* (Hexsel et al. 2009a) (Table 2), which is based on five important clinical and morphological aspects of cellulite providing a more detailed classification for cellulite: (A) number of evident depressed lesions, (B) depth of depressions, (C) morphologic appearance of skin surface alterations, (D) grade of flaccidity or sagging skin, and (E) grade of cellulite. Each of these items is graded from zero to three. The total sum of the scores of each item indicates the cellulite grading as mild, moderate, or severe, as shown in Table 3.

The *Cellulite Severity Scale* (Hexsel et al. 2009a) is an alpha-phononumeric scale. Its main advantage is that it can indicate which morphological aspect is the most significant component of cellulite for each patient, allowing the physician to determine the most suitable treatment for the patient. For example, a patient with important laxity (e.g., grade 3 of letter D) and mild

Table 2 Hexsel, Dal’Forno, and Hexsel e Cellulite Severity Scale (CSS) (Hexsel et al. 2010)

(A) Number of evident depressions	
This item refers to the total number of evident depressions by visual inspection in the area to be examined. The scores are expressed as follows:	
ZERO = None/no depressions	
1. A small amount: 1–4 depressions are visible	
2. A moderate amount: 5–9 depressions are visible	
3. A large amount: 10 or more depressions are visible	
(B) Depth of depressions	
This item evaluates the depth of depressions by visual inspection of the affected areas; comparison to the pictures of CSS is recommended	
ZERO = No depressions	
1. Superficial depressions	
2. Medium depth depressions	
3. Deep depressions	
(C) Morphological appearance of skin surface alterations	
Item C assesses the different morphological patterns of skin surface alterations; comparison with the pictures of CSS is recommended	
ZERO = No raised areas	
1. “Orange peel” appearance	
2. “Cottage cheese” appearance	
3. “Mattress” appearance	
(D) Grade of laxity, flaccidity, or sagging skin	
Laxity, flaccidity, or sagging skin confers the affected skin a draped appearance. This effect aggravates the appearance of cellulite. Item D assesses the grade of flaccidity, and comparison to the pictures of CSS is recommended	
ZERO = Absence of laxity, flaccidity, or sagging skin	
1. Slight draped appearance	
2. Moderate draped appearance	
3. Severe draped appearance	
(E) Classification scale by Nürnberger and Müller	
This item is based on the current classification of cellulite shown in Table 1. Patients should be evaluated in the standing position with relaxed gluteus muscles. However, if the patient has no evident depressions, they should be asked to contract their gluteus muscles or the <i>pinch test</i> should be applied (by pinching the skin between the thumb and index finger) in order to differentiate between scores 0 and 1 (see Fig. 1, item E – contracted)	
ZERO = Zero grade	
1. First grade	
2. Second grade	
3. Third grade	

Table 3 New classification of cellulite based on the results of scores of Cellulite Severity Scale

Points	New classification of cellulite
1–5	Mild
6–10	Moderate
11–15	Severe

depressed lesions (e.g., grade 1 of letter B) should be treated for laxity to have an important improvement in cellulite grading rather than undergoing a Subcision[®], which aims the treatment of depressed lesions.

De La Casa Almeida and cols (2013) assessed the intra- and interobserver reliability of the application of the CSS to a Spanish female population. They observed excellent reliability and internal consistency when used to evaluate cellulite on

Table 4 Comprehensive cellulite grading scale

Grade	Contour	Dimple density	Dimple distribution	Dimple depth	Diameter % change
0	Smooth	0	0	0	$100 \times \{[\text{pre-post}]/\text{pre}\}$
1	1 indentation	1–2/site	1 site	Shallow (1–2 mm)	
2	2 indentations	3–5/site	2 sites	Moderate (3–4 mm)	
3	3 indentations	6–8/site	3 sites	Advanced (5–6 mm)	
4	>3 indentations	>9/site	4 \geq sites	Deep (>7 mm)	

Sites (graded individually): buttock, anterior thigh upper, anterior thigh lower, posterior thigh upper, posterior thigh lower; upper refers to upper one-half and lower to lower one-half of thigh length

Diameter: mean difference in diameter (mm) on photographic superimposition

the buttocks and back of the thighs considered together. However, they considered that the dimension grade of laxity, flaccidity, or sagging skin does not contribute positively to the final consistency of the scale and suggested further analysis in greater depth in future studies.

The CSS has been used in some studies for the assessment of cellulite improvement after different treatments, being an objective and reliable tool to evaluate clinical trial outcomes (Hexsel et al. 2011, 2013; Knobloch et al. 2010).

Alexiades-Armenakas (Alexiades-Armenakas et al. 2008) and cols used a quantitative four-point grading scale to assess cellulite in a clinical trial that studied the use of unipolar radiofrequency treatment to improve the appearance of cellulite. However, there is no reference of validation of this scale (Table 4).

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