



# Stem cells in aesthetic dermatology: bioethical and professional obligations

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## Abstract

Recently, stem cells in aesthetics have attracted increased attention, especially as they have become a popular trend that is being mass-marketed to consumers on the Internet and social media. Unfortunately, studies have shown this marketing to be misleading as it portrays many purported benefits of stem cells that have yet to be proven in the limited studies that are available. It is important for clinicians to understand the evidence and marketing behind any new trends, especially in the fast-paced world of aesthetics, where treatments often outpace current medical understanding. As clinicians, we have bioethical and professional obligations to educate ourselves on current trends, ensure adequate patient safety, and advocate for continued consumer education.

**Keywords** Aesthetics · Dermatology · Skincare · Aging · Stem cells

For years, stem cells have grown to become a promising and potentially revolutionary treatment in medicine. Specific to dermatology, stem cell therapy has been applied to anti-aging, skin rejuvenation, and scar reduction, in addition to numerous conditions, including psoriasis, systemic scleroderma, burns, and epidermolysis bullosa [12]. Its marketing to consumers, especially on social media, frequently invokes allusions to the fountain of youth with its purported anti-aging benefits [9]. However, this has outpaced our scientific understanding, and current data are limited. As the demand for cosmetic procedures continues to rise, stem cell therapy will only attract more attention. Therefore, it is crucial for clinicians to understand the current marketing as well as the underlying ethical and professional obligations.

Traditionally, stem cells have been associated with bioethical dilemmas. Much of this earlier controversy was due to the use of human embryonic stem cells, which were first isolated from donated embryos during fertility treatments

[6]. Public debate came from fears for the creation of human clones, achievement of immortality, and death of what some consider to be human life. The uncertain availability of public funding for research fueled the search for alternative sources, such as adipose-derived and bone marrow-derived stem cells. However, these are also associated with bioethical concerns, including the interplay between limited data and informed consent processes [6, 7, 11].

More recently, the use of plant stem cells in skincare has garnered considerable attention. These represent an entirely different category than those derived from humans. However, there are instances of them being marketed to consumers as stem cell therapies without readily disclosing their source. Interestingly, most products contain only stem cell extracts and not live stem cells, where any clinical benefit may be due to their byproducts [15, 17]. Plant stem cells are often used in topical products for purposes of skin rejuvenation without data to support claims made about their efficacy [14]. There are no thorough studies examining the complete interaction and effects of plant stem cells on human skin. It has been argued that these products are just as effective as skin creams without the stem cells [17]. However, the plant stem cell market has benefitted from the lack of ethical and legislative roadblocks that are associated with human-derived stem cells.

While limited studies have begun to demonstrate some promise for the use of human-derived stem cells in aesthetic

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dermatology [20], those behind its marketing have not always exercised restraint, especially on the Internet and social media [3]. There have been broad and exaggerated claims about their ability to rejuvenate the skin as a safer, proven, more effective alternative with reduced downtime. As of 2017, 432 businesses in the United States with online prominence were selling unproven stem cell-based interventions [19]. These businesses were largely concentrated in California, Florida, Texas, Arizona, and Colorado. Most advertised the use of autologous stem cells sourced from adipose tissue and bone marrow, while some advertised allogenic stem cells derived from amniotic, umbilical, and placental tissue. Many companies even marketed having multiple types of stem cell treatment options available. The indications listed on websites for these stem cell-based interventions included orthopedic conditions, autism, unspecified skin diseases, and cosmetic-related concerns, such as aging.

Another analysis of 243 websites that advertised stem cell therapies found that 18% included the word “aging” and 21% included the word “cosmetic”, while 87% failed to mention the possible inefficacy of the treatment [10]. Only 13% of the websites included a statement, such as “Those who undergo stem cell treatment normally have about a 15% likelihood of receiving no benefits from stem cell treatment”. In addition, 75% made no mention about the general risks of stem cell procedures, and 69% failed to mention that stem cells are not approved by the Food and Drug Administration (FDA) for many disorders. In a similar study, less than 30% of 1091 websites reported information about patient outcomes and accreditation status [4].

The current evidence for stem cell therapy in aesthetic dermatology is limited to a few small randomized control trials. For example, in an 8-week trial, 48 women with photoaged skin were treated with amniotic membrane stem cell conditioned media (AMSC-CM) or normal saline combined with microneedling in an attempt to combat signs of aging [13]. The skin areas treated with AMSC-CM had significant improvements in clinical measures of pores, wrinkles, spot polarized, and spot UV parameters, but without any improvements in skin tone. Another trial studied the use of conditioned media (CM) with endothelial precursor cells (EPCs) derived from human embryonic stem cells (hESCs) [8]. Twenty-five women between the ages of 41 and 64 were enrolled in this split-face study, and they were treated on each side with either hESC–EPC–CM or saline, combined with microneedling. After five treatment sessions, pigmentation and wrinkles were significantly improved on the side treated with hESC–EPC–CM compared to the control. Animal studies have also been conducted using subcutaneous injections of adipose-derived stem cells in mice [20]. These studies have similarly shown increased dermal thickness, collagen density, fibroblast number, and angiogenesis. The increased fibroblast density is thought to contribute to the

increased dermal thickness and collagen synthesis. While these small trials demonstrated significance in various measures, there was neither long-term clinical data nor long-term safety profile available. The exaggerated claims made on websites of stem cell businesses have not yet been proven by high-quality studies. Instead, these websites should advertise that there is early promising evidence.

The unsubstantiated claims and misrepresentations may ultimately compromise consumer and patient safety. Patients should be well informed, especially regarding benefits, risks, and outcomes, to effectively allow for full patient autonomy. Current debate is ongoing regarding whether stem cells support tumorigenesis, which represents a major concern that patients should be aware of to support fully informed decision making [1, 5]. Even in the scientific community, broad claims have been made about the ability of stem cell treatments, including their potential to replace procedures, such as facelifts [2, 16]. Because of this, there should be a substantial effort by clinicians to work with media outlets to call for fair reporting and balanced consumer education. As of now, standardized treatments do not exist, and the FDA does not effectively regulate clinics offering stem cell therapies [18].

Clinicians are professionally and ethically obligated to provide patients with adequate information regarding treatments, especially those that are considered to be elective in nature. It is important that patients understand both the short- and long-term implications of any procedure. In the case of aesthetic stem cell treatments, only limited data are readily available. When discussing cosmetic treatments with patients, clinicians should offer verbal as well as written information, since they may not retain all of the information from the encounter [21]. Patients should also be provided balanced, unbiased, professional resources to seek reputable outside opinions.

In cases where stem cell therapies are considered to be an elective cosmetic treatment, they may be performed by non-physicians or by providers located in countries outside of the United States. This inherently comes with its own concerns, including patient safety and well-being. It is important for patients to consider whether the practitioner possesses the appropriate level of training and if there is sufficient oversight. Clinicians have a professional duty to caution patients about performing the necessary background research prior to receiving any new procedures.

While stem cell therapy in aesthetics may sound promising, clinicians and consumers should continue to exercise caution. The current state of marketing only serves to reinforce this notion. More research is still needed for both topical stem cell formulations and stem cell procedures. There are still too many unknowns that currently exist. As clinicians, we have professional and ethical obligations to advocate for consumer and patient safety above all else. In

the world of aesthetics, where marketing often outpaces our understanding, this holds especially true.

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### Compliance with ethical standards

**Conflict of interest** The authors have no conflict of interest to declare.

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