

Minimally Invasive Facial Rejuvenation: Review

¹Abdullah Ayed Al_Nefaie, ²Abdullah Khalid Alsuwat

Abstract: The present study describes and overview the procedures of a minimally invasive technique of facial skin rejuvenation, as a reconstructive cosmetic intervention, also aimed to evaluate the different techniques used in facial rejuvenation. We Conducted a comprehensive computerized review of literature reporting minimal invasive technique of facial rejuvenation published in English language until January,2017 this search was performed using electronic databases; PubMed, Medline, and Embase. Choosing the ideal therapy method which will certainly be the secret to success in skin restoration depends upon cautious evaluation as well as figuring out the patient's requirements, skin kind and problem, to mount a therapy strategy. Excellent prospects for minimally invasive methods have the tendency to have minimal face sagging. Patients must understand that skin appearance will improve and great lines will certainly be softened but not eliminated. Cumulative aesthetic benefits will certainly occur slowly and will certainly be less dramatic than those seen with ablative resurfacing.

Keywords: facial skin rejuvenation, minimal invasive technique, patient's.

1. INTRODUCTION

Aging is a raising concern of modern-day culture, specifically aging of the face. This is a complicated procedure entailing 2 important factors: quantity loss throughout the face, as well as recurring muscular tissue movements that cause wrinkles and also folds ⁽¹⁾. Traditionally, face renewal has concentrated on different dermatologic cosmetic procedures such as CO₂ laser resurfacing, microdermabrasion, and electric excitement leading to collagen production in human skin fibroblasts ^(2,3). The background of face restoration has been dominated by the adjustment of the dermal layers to fix the results of aging ⁽⁴⁾. The modus operandi of the surgeon is cells excision with displacement under stress acting on only 2 measurements of the face. The skin is tightened up in the horizontal and upright aircrafts, but the volume of the face, the volume, is not considered; for that reason, skin firm alone can make the face appearance worse. The desired final impact is firm, intense, hydrated skin obtained by the shot in the superficial dermis of suitable products that are entirely absorbable and flawlessly biocompatible ⁽⁵⁾. Shot of mesotherapy products advertises skin restoration by boosting both hydration as well as fibroblast activation ^(6,7). A number of speculative research studies have actually shown that hyaluronic acid infused right into the skin could boost fibroblasts to share collagen kind 1 (Col-1), matrix metalloproteinase-1 (MMP-1), as well as tissue prevention of matrix metalloproteinase-1 (TIMP) ⁽⁸⁾. An additional research study recommended that dermal injection of vitamins causes excitement of collagen manufacturing in skin cells ⁽⁹⁾. It is additionally well known that antioxidant compounds are able to turn around aging. One the most studied hypotheses regarding aging is that it is brought on by oxidative stress and anxiety, and also oxidation can damage healthy proteins, DNA, and also lipids.

The present study describes and overview the procedures of a minimally invasive technique of facial skin rejuvenation, as a reconstructive cosmetic intervention, also aimed to evaluate the different techniques used in facial rejuvenation.

2. METHODOLOGY

We Conducted a comprehensive computerized review of literature reporting minimal invasive technique of facial rejuvenation published in English language until January,2017 this search was performed using electronic databases; PubMed, Medline, and Embase.

3. RESULTS

o **Minimally Invasive Modalities for Skin Rejuvenation:**

Selecting the proper therapy modality which will certainly be the trick to success in skin rejuvenation depends on careful evaluation and identifying the patient's demands, skin type and problem, to mount a treatment strategy ⁽¹⁰⁾. Excellent prospects for minimally intrusive methods tend to have marginal face sagging. Patients need to comprehend that skin structure will certainly enhance and fine lines will certainly be softened but not eradicated. Cumulative aesthetic benefits will certainly happen slowly and will be much less dramatic than those seen with ablative resurfacing ⁽¹¹⁾. Patients with Fitzpatrick skin type III or much less are normally best prospects for different procedures with minimal risk of issues ^(12,13).

The goal of the majority of minimally invasive therapies is to induce discerning dermal injury which leads to wound repair action; while keeping the overlapping skin undamaged ⁽¹⁴⁾. In feedback to the caused dermal injury, the healing process starts to stimulate the fibroblast with deposition as well as reorientation of collagen packages ⁽¹⁵⁾. Such methods for skin rejuvenation could be identified into 2 types, the initial relates to therapy of ectatic vessels, pigmentation and also pilosebaceous changes, while the second refers to facial remodeling with wrinkle reduction and/or skin tightening up ^(16,17). Minimally intrusive skin rejuvenation techniques could be classified right into several various general modalities consisting of: non-ablative laser innovations and source of lights, non-laser methods (radiofrequency [RF] ultrasounds and systems), electro-optical synergy (ELOS) strategy close to other strategies as well as procedures (surface chemical peels off, microdermabrasion, injectable fillers, neurotoxins, skin needling, mesotherapy, platelet-rich plasma [PRP] and stem cell therapy) (Figure 1) ^(12,17).

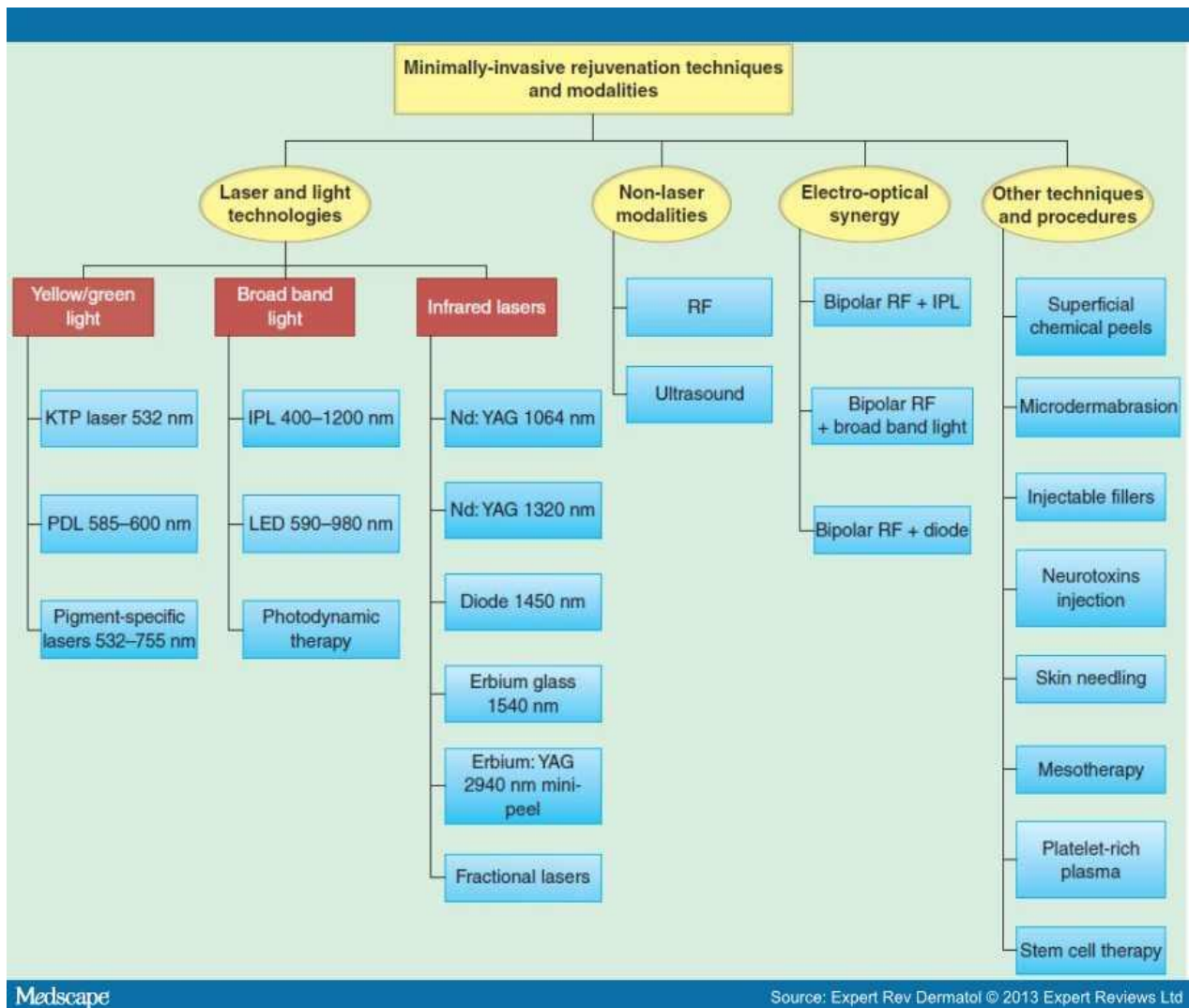


Figure1: Minimally invasive techniques and modalities for skin rejuvenation.

Non-ablative rejuvenation for facial rejuvenation:

Non-ablative renewal explains innovations, which enhance aging structural modifications in the skin without disturbance of cutaneous honesty, lessen downtime, and low risk account. A recap of these modern technologies exists in (Table 1)⁽²⁸⁾. Signs for non-ablative renewal include both epidermal Type I along with facial (Type II) signs. Type I indicators relate to vascular abnormalities, pilosebaceous changes, and also pigmentary skin alterations. Kind II photorejuvenation considerations relate to dermal as well as subcutaneous senescence factors to consider. These factors are aimed at enhancing the photoaging triad as well as prophylaxing of both the intrinsic in addition to extrinsic aging procedures^(29,30,31). The clinical rationale through which this architectural strategy to photorejuvenation is accorded to consists of age-related modifications in dermal matrix elements including collagen, elastic fibers, glycosaminoglycans, and fibroblasts (Table 2). The rest of this writing details the major clinical and scientific developments in light sources and also radiofrequency tools as pertaining to this freshly emerging field of photorejuvenation. The epidermis and also surface dermis can be uniquely harmed by 2 fundamental devices: (a) by targeting discrete chromophores in the dermis or at the facial- epidermal junction or (b) by using mid infrared (IR) lasers in the variety of 1.3 - 1.55 mm, wavelengths^(29,30,31).

Table 1: Available Non-Ablative Rejuvenation Technologies

<i>Superficial chemical peels</i>
<i>Microdermabrasion</i>
<i>Botulinum toxins A, B</i>
<i>Intense pulsed light sources (585–1,100 nm)</i>
<i>Laser technologies</i>
• Yellow Light
Potassium titanyl phosphate (KTP) laser (532 nm)
CuBr laser (578 nm)
Pulsed dye laser (PDL) (585–600 nm)
N-Lite laser (585 nm)
• Broad band light (500–1,100 nm)
Intense pulsed light (IPL) (500–1,100 nm)
• Infrared lasers
Nd:YAG (1,064 nm)
Cool Touch (1,320 nm)
Smooth beam (1,450 nm diode)
Aramis (1,540-mm erbium glass laser)
• Non-laser modalities
Radiofrequency technologies (Thermage)
Ultrasound

Table 2: Scientific Basis of Non-Ablative Resurfacing

• Collagen
Each year, we lose 1% of facial dermal collagen
Anchoring fibrils are decreased in photoaged skin
• Elastic Fibers
Aging and UVA/UVB increase elastic tissue breakdown by increasing expression of elastin
• Glycosaminoglycans
Decrease with aging leading to decreased water content, decreased cell adhesion, migration, development, and differentiation
• Fibroblasts
The number of fibroblasts decrease with age

Potassium Titanyl Phosphate Laser 532 nm:

The potassium titanyl phosphate (KTP) laser makes use of a 1064 nm neodymium: yttrium-aluminum garnet (Nd: YAG) source passed through a KTP crystal to emit light with a wavelength of 532 nm⁽¹⁷⁾. This green light wavelength is soaked up by both hemoglobin as well as melanin. Therefore, both undesirable vessels as well as pigment can be treated. At the same time, textural improvement is also seen, however to a much minimal extent⁽¹¹⁾. The KTP laser's 532 nm wavelength refers the 542 nm absorption top of hemoglobin, which makes it fairly particular for cutaneous blood vessels⁽¹⁷⁾. Single vessels are traced by using a place size near to the very same vessel's size. This will certainly bring power just to the targeted vessel as well as very closely neighboring tissues, resulting in photocoagulation without extravasation of the vessel web content, with subsequent sparing of normal capillaries^(18,19). On comparing green with yellow light, the high absorption of 532 nm KTP by melanin is the only theoretical disadvantage, making it inappropriate for treatment of darker skin types^(20,21).

Pulsed Dye Laser:

Pulsed color lasers (PDL) discharge yellow light at 585 - 595 nm which uniquely targets hemoglobin and melanin. This wavelength permits a 50% dermal penetration with 400 µm depth, as well as is specifically soaked up by blood vessels. Therefore, improving the release of inflammatory moderators from endothelial cells within the targeted vessel with subsequent stimulation of fibroblast activity to generate brand-new collagen^(15,22). Lots of researches recommended the potential role of PDLs in the treatment of photodamaged skin by the clear clinical as well as histologic enhancement seen with PDL-treated patients⁽¹⁵⁾. Enhancement in the appearance of wrinkles has been observed following exposure to short pulsed 585 nm laser light at low energy degrees (2- 3 J/cm²)⁽¹⁷⁾. [Longer pulses theoretically allow much more home heating of bigger blood vessels with much less risk of purpura, hence minimizing the downtime⁽²³⁾. Despite authorization by the US FDA for dealing with photodamage with the PDL, only modest outcomes have been observed with these wavelengths, most likely because of mostly vascular targeting and also shallow penetration to the papillary dermis⁽¹⁷⁾.

Pigment-specific Lasers:

Pigment-specific lasers are used to deal with the pigmentary changes that accompany photodamage, including solar lentigines, ephelides or blemishes. These consist of Q-switched (QS) Nd: YAG (532 nm), QS ruby (694 nm) and QS alexandrite (755 nm) lasers along with QS 1064 nm (infrared range) laser⁽¹⁶⁾.

The regularity doubled Nd:

YAG laser produces radiation with a wavelength at 532 nm and also a pulse period in split seconds. Using QS lasers in the treatment of pigmented lesions adheres to the concept of selective photothermolysis thus limiting the damage to the melanosome-containing cells. At 532 nm, the wavelength is soaked up not only by melanin yet also by hemoglobin^(15,24). Ruby laser 694 nm with 2 - 50 ns pulse period, was the very first QS laser system created for facial and also skin pigmented sores; however, care is a must as patients with darker skin types could establish long-term hypopigmentation^(24,25). The QS alexandrite 755 nm laser with 50- 100 ns (a little longer pulse period) is made use of to deal with lentigines with much less skin interruption. Lightening without ablation of the epidermis is normally the therapy end point⁽²⁶⁾. Discoloration, crusting in addition to short-term and permanent pigmentary changes are not unusual adverse effects, causing some longer downtime⁽²⁷⁾.

Cosmetic Mesotherapy:

Mesotherapy, initially developed in Europe, is a minimally invasive strategy that includes the intraor subcutaneous shot of variable blends of natural plant removes, homeopathic representatives, drugs, vitamins, and also other bioactive substances in tiny quantities through dermal multipunctures. Its application in aesthetic medicine as well as surgery is getting in appeal and approval and is quickly expanding in account at an alarming price⁽²⁸⁾. With the continuing escalating trend in cosmetic surgery being towards much less intrusive and even noninvasive treatments instead of formal surgical treatment in both exclusive as well as academic settings, considerable focus in the ordinary as well as specialist literary works has actually been paid lately to mesotherapy, supported as a nonsurgical option to liposuction for body contouring⁽²⁹⁾, for liquifying undesirable fat down payments^(30,31). Dietary adjustment, hormonal agent replacement treatment, workout, as well as dietary supplements are typically used together with mesotherapy⁽²⁹⁾. Although real device of mesotherapy continues to be unknown⁽³²⁾, and despite the fact that there is very little scientific proof maintaining its prevalent use, the area of nonsurgical lipolysis has actually expanded significantly in the past few years, ending up being a typical approach in cosmetic medicine, either through topical treatments (lotions, liquids) or through regional shots of

energetic principals⁽³³⁾. Lipolysis (lipolysis/fatty acid oxidation) and also lipogenesis (lipid synthesis) are two standard and also critical metabolic functions of adipocytes that occur continually throughout the life of the cell⁽³⁴⁾. The equilibrium of lipolysis and lipogenesis varies in accordance with structural area, age, race, and also sex, and also ultimately identifies adipocyte quantity⁽³⁴⁾. Specifically, lipolysis represents the process by which intracellular triacylglycerol (TG) is hydrolyzed or weakened right into totally free fats (FFAs) and also glycerol which are then released into flow⁽³⁵⁾. The internet level of lipolysis is figured out by the interplay of stimulatory (lipolytic) as well as inhibitory (antilipolytic) paths. It has actually been presumed that pharmacologic representatives that raise localized lipolysis ought to tip the equilibrium toward lipid loss, consequently resulting in the control of smaller sized fat cells. It is hence suggested that delivery of lipolytic energizers locally, whether by injection or by topical application, will certainly create neighborhood weight loss. Mesotherapy qualifies presently as one of the " most popular" topics in aesthetic medicine⁽³⁶⁾. Mesotherapy is most generally employed today for the reduction of fat as well as cellulite. Especially produced formulas are claimed to reduce fat content in the cellulite, enhance damaged circulation, and break down harmed connective tissue, consequently smoothing the skin surface area. Such formulas are claimed also to stop cells from saving fat and assist break down existing fat cells apparently by causing tear as well as cell death of adipocytes^(30,36).

4. CONCLUSION

Choosing the ideal therapy method which will certainly be the secret to success in skin restoration depends upon cautious evaluation as well as figuring out the patient's requirements, skin kind and problem, to mount a therapy strategy. Excellent prospects for minimally invasive methods have the tendency to have minimal face sagging. Patients must understand that skin appearance will improve and great lines will certainly be softened but not eliminated. Cumulative aesthetic benefits will certainly occur slowly and will certainly be less dramatic than those seen with ablative resurfacing.

REFERENCES

- [1] Buck DW, Alam M, Kim JYS. Injectable fillers for facial rejuvenation: a review. *J Plast Reconstr Aesth Surg*. 2009;62:11–18.
- [2] Oringer JS, Kang S, Johnson TM, et al. Connective tissue remodeling induced by carbon dioxide laser resurfacing of photodamaged human skin. *Arch Dermatol*. 2004;140:1326–1332.
- [3] Tan WQ, Gao ZJ, Xu JH, et al. Inhibiting scar formation in vitro and in vivo by adenovirus-mediated mutant Smad4: a preliminary report. *Exp Dermatol*. 2011;20:119–124.
- [4] Kanchwala SK, Holloway L, Bucky LP. Reliable soft tissue augmentation. A clinical comparison of injectable soft-tissue fillers for facial-volume augmentation. *Ann Plast Surg* 2005;55:30e5.
- [5] Iorizzo M, De Padova MP, Tosti A. Biorejuvenation: theory and practice. *Clin Dermatol*. 2008;26:177–181.
- [6] Tammi MI, Day AJ, Turley EA. Hyaluronan and homeostasis: a balancing act. *J Bio Chem*. 2002;277:4581–4584.
- [7] Yoneda M, Shimizu S, Nishi Y, et al. Hyaluronic acid-dependent change in the extracellular matrix of mouse dermal fibroblasts that is conducive to cell proliferation. *J Cell Sci*. 1988;90:275–286.
- [8] Gao F, Liu Y, He Y, et al. Hyaluronan oligosaccharides promote excisional wound healing through enhanced angiogenesis. *Matrix Biol*. 2010;29:107–116.
- [9] Greens J C, Hendricks L J, Falkenstein PA, et al. Regulation of collagen synthesis by ascorbic acid: characterization of the role of ascorbate-stimulated lipid peroxidation. *Arch Biochem Biophys*. 1991;290:127–32.
- [10] Roberts WE. Skin type classification systems old and new. *Dermatol. Clin*. 27(4), 529–533 (2009).
- [11] DeHoratius DM, Dover JS. Nonablative tissue remodeling and photorejuvenation. *Clin. Dermatol*. 25(5), 474–479 (2007).
- [12] Battle EJ, Soden CJ. The use of lasers in darker skin types. *Semin. Cutan. Med. Surg*. 28(2), 130–140 (2009).
- [13] Hantash BM, Gladstone HB. Current role of resurfacing lasers. *G. Ital. Dermatol. Venereol*. 144(3), 229–241 (2009).
- [14] Orringer JS, Voorhees JJ, Hamilton T et al. Dermal matrix remodeling after nonablative laser therapy. *J. Am. Acad. Dermatol*. 53(5), 405–410 (2005).

- [15] Sadick NS. Update on non-ablative light therapy for rejuvenation: a review. *LasersSurg. Med.* 32(2), 120–128 (2003).
- [16] Dierickx CC, Anderson RR. Visible light treatment of photoaging. *Dermatol. Ther.* 18(3), 191–208 (2005).
- [17] Adamic M, Troilius A, Adatto M, Drosner M, Dahmane R. Vascular lasers and IPL: guidelines for care from the European Society for Laser Dermatology (ESLD). *J. Cosmet. Laser Ther.* 9(2), 113–124 (2007).
- [18] Nelson JS, Majaron B, Kelly KM. What is nonablative photorejuvenation of human skin? *Semin. Cutan. Med. Surg.* 21(4), 238–250 (2002).
- [19] Spendl S, Prandl EC, Schintler MV *et al.* Treatment of spider leg veins with the KTP (532 nm) laser—a prospective study. *LasersSurg. Med.* 31(3), 194–201 (2002).
- [20] Cassuto DA, Ancona DM, Emanuelli G. Treatment of facial telangiectasias with a diode-pumped Nd:YAG laser at 532 nm. *J. Cutan. Laser Ther.* 2(3), 141–146 (2000).
- [21] Weiss RA, Weiss MA, Beasley KL, Munavalli G. Our approach to non-ablative treatment of photoaging. *Lasers Surg. Med.* 37(1), 2–8 (2005).
- [22] Zdinak LA, Summerfield ME. Nonablative skin therapies. *Ophthalmol. Clin. North Am.* 18(2), 237–248 (2005).
- [23] Goldberg DJ, Sarradet D, Hussain M, Krishtul A, Phelps R. Clinical, histologic, and ultrastructural changes after nonablative treatment with a 595-nm flashlamp-pumped pulsed dye laser: comparison of varying settings. *Dermatol. Surg.* 30(7), 979–982 (2004).
- [24] Rinaldi F. Laser: a review. *Clin. Dermatol.* 26(6), 590–601 (2008).
- [25] Kishi K, Okabe K, Ninomiya R *et al.* Early serial Q-switched ruby laser therapy for medium-sized to giant congenital melanocytic naevi. *Br. J. Dermatol.* 161(2), 345–352 (2009).
- [26] Choi JE, Kim JW, Seo SH *et al.* Treatment of Becker's nevi with a long-pulse alexandrite laser. *Dermatol. Surg.* 35(7), 1105–1108 (2009).
- [27] Rosenbach A, Lee SJ, Johr RH. Treatment of medium-brown solar lentigines using an alexandrite laser designed for hair reduction. *Arch. Dermatol.* 138(4), 547–548 (2002).
- [28] Rotunda A, Kolodney MS (2006) Mesotherapy and phosphatidylcholine injections: historical clarification and review. *Dermatol Surg* 32:465–480
- [29] Matarasso A, Pfeiffer TM, the Plastic Surgery Educational Foundation DATA Committee (2005) Mesotherapy for body contouring. *Plast Reconstr Surg* 115:1420–1424
- [30] Lawrence N (2003) Commentary: no smoking gun: findings from a national survey of office-based cosmetic surgery adverse event reporting. *Dermatol Surg* 29:1099
- [31] Tonkovic-Capin M, Riddle CC, Schweiger ES, Aires DJ, Manson SH, Tonkovic-Capin V (2007) Brief discussion: medicolegal aspects of consent and checklists for common cosmetic procedures. *Cosmet Dermatol* 20(5):291–294
- [32] Rohrich RJ (2005) Mesotherapy: what is it? does it work? *Plast Reconstr Surg* 115:1425
- [33] Salti G, Ghersetich I, Tantussi F, Bovani B, Lotti T (2008) Phosphatidylcholine and sodium deoxycholate in the treatment of localized fat: a double-blind, randomized study. *Dermatol Surg* 34:60–66
- [34] Prins JB, O’Rahilly S (1997) Regulation of adipose cell number in man. *Clin Sci* 92:3–11
- [35] Londos C, Brasaemle DL, Schultz CJ, Adler-Wailes DC, Levin DM, Kimmel AR, Rondinone CM (1999) On the control of lipolysis in adipocytes. *Ann N Y Acad Sci* 892:155–168
- [36] Gyskiewicz JM, Adams WP Jr (2006) Plastic surgeons rate the “hot topics”. *Aesthetic Surg J* 26:479–484