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Review Article

Autologous fat transfer for hand rejuvenation: A systematic review on technique and outcome

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ABSTRACT

Background: Age-related changes to the dorsum of the hand present as dyschromia, soft-tissue atrophy, and volume loss, resulting in wrinkles and prominent deep structures. Volume augmentation by means of autologous fat transfer (AFT) is one of the options to rejuvenate the hand; theoretically, autologous fat is the ideal filler because of durability and biocompatibility.
Objective: This systematic review aims to summarize and describe the current evidence on the technique, effectiveness, and safety of AFT in hand rejuvenation.
Methods: Three major databases, PubMed, Embase, and Web of Science, were systematically searched up to November 2020 for studies reporting on AFT and hand rejuvenation.
Results: A total of 10 articles were included, reporting on a total of 320 patients treated by AFT to improve the aesthetic appearance of the dorsum of the hand. Some degree of postoperative oedema was present in nearly all patients. Other complications were infection (0.67%), cysts/irregularities (1.3%), temporary dysesthesia (5.3%), and ecchymosis (7%). There were no major compli-

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cations. Of all patients, 97.6% self-reported to be satisfied with the result.

Conclusions: Overall, by combining the current evidence, AFT is considered a promising and safe technique to rejuvenate the aging hand with very high patient satisfaction. Future research, using validated patient questionnaires, objective volumetric measurements, and longer follow-up, is needed to confirm these results.

Level of Evidence: 3

Introduction

Aesthetic surgery is a popular and successful way to counteract changes as a result of aging; however, it focusses mainly on the face. There has been a growing interest in hand rejuvenation over the last few years. This could be especially worthwhile in patients also considering facial aesthetic surgery because the hands are the most visible parts of the body after the face and neck. Potential changes as a result of aging are dyschromia or age spots, soft-tissue atrophy, and volume loss, resulting in wrinkles, thin translucent skin and prominent veins, and tendons and bones. These findings are most profound on the dorsal aspect of the hand[1]. Therapeutic options to improve the appearance of the aging hand include chemical peels, laser therapy, sclerotherapy, dermal fillers, and autologous fat transfer[2, 3].

Autologous fat transfer (AFT), also known as lipofilling or fat grafting, is a frequently used surgical technique in plastic surgery. Its use is well established to correct soft-tissue contour deformities and volume deficits. However, the use of AFT is not simply related to its volumizing effect. AFT is assumed to have regenerative qualities and has been successfully applied for scar treatment and tissue restoration[4].

When volume augmentation is desired in hand aesthetic surgery, the options are dermal fillers or autologous fat transfer. Although dermal fillers require no anaesthesia and cause no donor-site morbidity, their effects are temporary and may cause foreign-body granulomata, often requiring surgical treatment[5, 6]. AFT on the other hand is slightly more invasive, but it seems to be the ideal filler because it is biocompatible and durable, with possible dermal regeneration[7].

During the last decade, many reports have been published regarding AFT for hand rejuvenation: most of these are overview articles on hand rejuvenation or a description of technique; however, very few articles actually assess effectiveness and safety of this treatment. We systematically report, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, the evidence on the technique and outcome of AFT in hand rejuvenation. The aim of this study is to identify and describe the current evidence on hand rejuvenation and AFT to combine available evidence to promote or discourage this treatment option.

Methodology

The systematic review was conducted by following a predefined protocol using Patient, Intervention, Comparison, and Outcome (PICO) and clearly set inclusion and exclusion criteria. The PRISMA guidelines were followed.

Search Methodology

A systematic literature search of PubMed, Embase, and Web of Science was performed for studies published up to and including 7th November 2020. The search strategy was identical in all databases:

(fat OR lipo*) AND (aging hand OR hand rejuvenation OR hand volume loss OR hand augmentation). There were no limits, and all fields (both free-text and index terms) were searched. Additionally, the reference list of the selected articles was manually screened for further publications.

Study Selection and Eligibility Criteria

After the exclusion of duplicates, all records were screened for title and abstract. Full texts of all relevant articles, ensuring their relevance to AFT and hand rejuvenation, were assessed for eligibility. The PICO question was stated as: (P) adults with aging of the dorsal aspect of the hand, (I) autologous fat transfer to the dorsum of the hand, (C) no treatment or a different treatment for which the results will not be included in the review unless it was by another AFT technique, and (O) patient/surgeon/independent observer evaluation, volume measurements, and complications.

The following inclusion/exclusion criteria were defined before data collection:

- Case reports, case series, observational studies, and clinical trials on AFT and hand rejuvenation, with or without the comparator arm and without restrictions on the sample size or minimal follow-up period.
- Articles in English.
- Conference proceedings, book chapters, editorials, letters, technical notes, and overview articles were excluded.
- Postoperative data should be available.

The final selection of included articles was performed independently by two reviewers. Where disagreement existed, this was solved through discussion until consensus was reached.

Data extraction

Data were extracted from the articles, including tables and figures, independently by two authors. The extracted data included: author(s), year of publication, study design, patient demographics, technique of fat harvest, processing and injection, duration of follow-up, and determinants of clinical outcome.

Assessment of quality

Level of evidence (LOE) for each article was determined using the American Society of Plastic Surgeons (ASPS) guidelines[8]. Additionally, included randomized controlled trials (RCT) were scored with the PEDro critical appraisal tool and the Cochrane risk of bias tool[9, 10]. Observational studies with a comparison group were scored with the Newcastle-Ottawa quality assessment scale[11]. Case reports and case series were not scored but automatically classified as low quality.

Results

Study characteristics and quality of included studies

The initial database search resulted in 5143 articles. An additional two articles were identified from other sources (reference list screening). After the removal of duplicates, a total of 3975 articles were screened on the title and abstract. This resulted in 45 potential studies that were assessed for eligibility by full-text screening. A total of 10 studies met our inclusion criteria and were selected for data extraction[12-21]. Figure 1 shows the flow diagram of the search strategy.

The included studies were published between 1992 and 2019, with two RCTs[14, 15], two observational studies with a comparison group[17, 21] and six case series[12, 13, 16, 18-20]. The level of evidence for these studies was 2, 3, and 4, respectively. The two RCTs were scored using the PEDro tool and the Cochrane risk of bias tool. These articles scored 3 and 5 of 11 for PEDro and were low quality according to Cochrane. These low scores were mainly related to methodological flaws in selection,

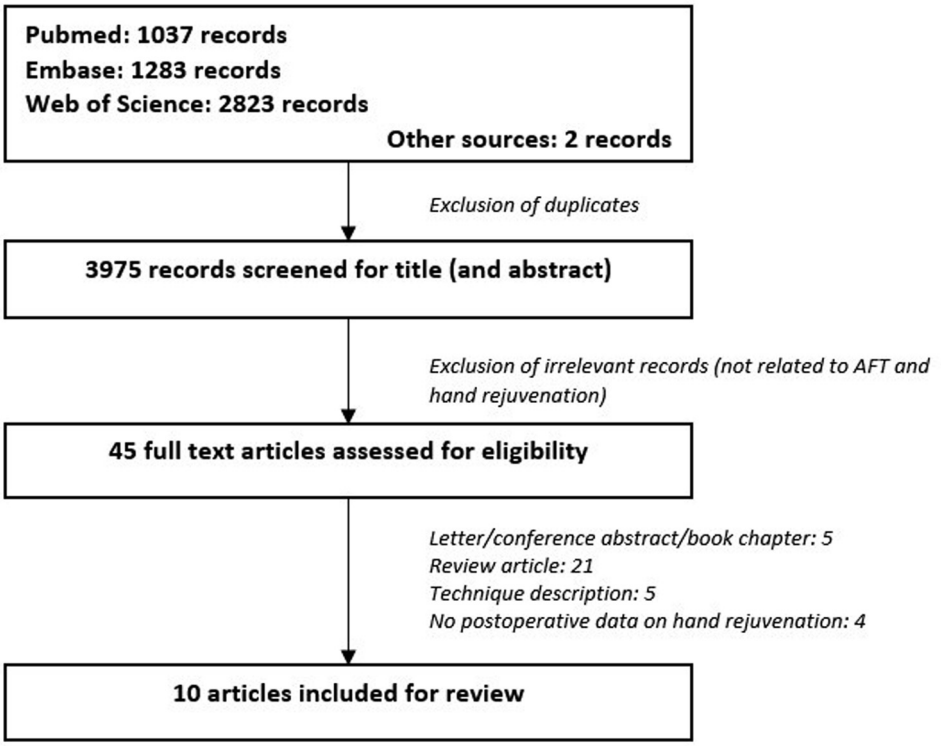

Figure 1. Flow diagram of the search strategy

performance, and processing of outcome data. The two observational studies that included a comparison group were scored with the Newcastle-Ottawa scale and had scores of 8 and 9 of 9, indicating low risk of bias. All other studies were considered low quality because of the lack of comparison, small numbers of patients, variable but mostly short follow-up, and lastly since selection, treatment, and assessment of outcome were often performed by the same clinician. All studies involved a total of 320 patients treated with AFT for hand rejuvenation purposes. Of these patients, 93.1% are female. The mean age varied between 49.2 and 58.0 years. Mean follow-up varied between 3 and 12 months (range 3-88 months). Results are shown in Table 1.

Fat grafting technique

All included articles described, to some extent, the technique of fat harvest, processing, and injection (Table 2). The abdomen was the most frequently used donor site. Only Aboudib et al. used either manual aspiration or a liposuction device to harvest the fat, and all other authors manually harvested the fat[12]. The fat was harvested with 2-3 mm cannulas, attached to either 10 or 20 ml syringes. The preparation of fat was performed solely by centrifugation in five studies[13, 16, 17, 20, 21]. Other authors used NaCl wash before centrifugation[19], decantation alone[18], NaCl wash before decantation[12], or decantation and centrifugation combined[14, 15]. One study compared the result of AFT prepared by decantation and centrifugation with decantation alone[14], and one study compared the use of fresh and frozen fat[15]. Fat enrichment was performed in only two studies; platelet-rich plasma (PRP)[21] and stromal vascular fraction (SVF)[17] were used to supplement the fat in two comparative studies. In nine of 10 studies, injection cannulas were blunt and ranged from 1-1.4 mm[13-21], whereas Aboudib et al. injected the fat with a 1 or 2 mm needle[12]. Some variation existed regarding injection technique. The oldest article reported bolus injection followed by digital manipulation[12], whereas all other authors

Table 1
Study characteristics.

	Study design	LOE	Quality	No. of patients	Female patients (%)	Mean age in years (range)	Reported outcomes	Follow-up (months)
Aboudib et al., 1992[12]	Case series	4	NA	72	NR	58 (35-78)	Technique, Satisfaction, and Complications	12
Coleman, 2002[13]	Case series	4	NA	22	20 (90.9)	NR (range 36-83)	Technique and complications	NR
Butterwick, 2002 [14]	Randomized, double-blind clinical trial	2	5/11[1] Low quality[2]	14 (28 hands)	14 (100)	53.5 (41-64)	Technique, satisfaction, and complications	5
Butterwick et al., 2006 [15]	Randomized, double-blind clinical trial	2	3/11[1] Low quality[2]	10 (20 hands)	10 (100)	53 (41-66)	Technique, satisfaction, and complications	5
Agostini et al., 2015[16]	Case series	4	NA	22	22 (100)	55.9 (41-72)	Technique, satisfaction, and complications	mean 38 (range 10-88)
El Kahky et al., 2017[17]	Single-blind, nonrandomized comparative study	3	8/9[3]	20 (40 hands)	20 (100)	49.2 (45-55)	Technique and satisfaction	3
Fantozzi, 2017[18]	Case series	4	NA	65	50 (76.9)	51.3 (33-81)	Technique, satisfaction, and complications	12
Zhou et al., 2017[19]	Case series	4	NA	17	17 (100)	51.5	Technique, satisfaction, volumetric measurements, and complications	mean 8.3 (range 6-12)
Yun-Nan et al., 2018[20]	Case series	4	NA	68	68 (100)	56 (38-70)	Technique, satisfaction, and complications	mean 32 (range 10-64)
Sasaki, 2019[21]	Randomized case-control study	3	9/9[3]	10 (20 hands)	10 (100)	54.4 (46-67)	Technique, satisfaction, volumetric measurements, and complications	12

[1] PEDro scale
[2] Cochrane risk of bias tool
[3] Newcastle-Ottawa scale
Abbreviations: LOE = level of evidence; NA = not applicable; NR = not reported

Table 2
Fat grafting technique

	Donor site	Harvest	Harvest cannula + syringe	Preparation	Enrichment	Injection cannula + syringe	Injection technique	Injection plane	Volume injected	No. of sessions	Postoperative care
Aboudib et al.[12]	Medial knee, abdomen, and hip	MA or LD	2-3 mm	NaCl wash + decantation	None	2 mm or 18-gauge needle + 10 ml syringe	Dorsal bolus followed by gentle digital manipulation	NR	10-15 ml	NR	Elevate (1 wk). No physical activity (4 wks).
Coleman[13]	Abdomen and medial thigh	MA	3 mm + 10 ml syringe	Centrifugation	None	17-gauge + 1 ml syringe	Multiple incisions, retrograde, and fanning	Subdermal	>20 ml	1 (20)/2 (2)	Slight compression with microfoam tape (3-4 d)
Butterwick[14]	Medial knee, hip, and thigh	MA	12-gauge + 10 ml syringe	Decantation + centrifugation Decantation alone	None	18-gauge + 1 ml syringe	Single incision (wrist), retrograde, and fanning	NR	10 ml	1	Elevate (1 wk). Normal activity allowed.
Butterwick et al.[15]	Medial knee, hip, and thigh	MA	12-gauge + 10 ml syringe	Decantation + centrifugation Fresh or frozen	None	18-gauge + 1 ml syringe	Single incision (wrist), retrograde, fanning	NR	10 ml	1	Elevate (1 wk). Normal activity allowed.
Agostini et al.[16]	Abdomen	NR	blunt + 10 ml syringe	Centrifugation	None	16-gauge + 1 ml syringe	Multiple incisions and retrograde fanning (hand + fingers)	Superficial layer	10-20 ml	NR	Elevate (2 d). Avoid manual activity (1 wk). Foam pad dressing (10 d).
El Kahky et al.[17]	Abdomen	MA	Coleman microcannula + 10 ml syringe	Centrifugation	SVF None	NR	Single incision (wrist), retrograde, fanning, and massage	NR	±10 ml	1	Light compression bandage (48 h). Elevate (24 h). No strenuous manual activity (1 wk)

(*continued on next page*)

Table 2 (*continued*)

	Donor site	Harvest	Harvest cannula + syringe	Preparation	Enrichment	Injection cannula + syringe	Injection technique	Injection plane	Volume injected	No. of sessions	Postoperative care
Fantozzi[18]	Abdomen and medial thigh or knee	MA	3 mm + NR	Decantation	None	1.4 mm + NR	Fanning	Superficial layer	10-30 ml	1 (58)/2 (7)	Antibiotics (7 d)
Zhou et al.[19]	Abdomen or thigh	MA	20-gauge + 20 ml syringe	NaCl wash + Centrifugation	None	17-gauge + NR	Low pressure, low speed, low volume, multi-tunnels, multi-planes, and multi-points	Superficial and deep layer	13-39 ml (avg. 25.5 ml)	1-2 (NS)	NR
Yun-Nan et al.[20]	Abdomen or thigh	MA	2.5 mm + 10 ml syringe	Centrifugation	None	16-gauge + 1 ml syringe (MAFT-gun®)	Multiple incisions, multi-layered micro-autologous fat transfer.	Deep, middle, and superficial layer	avg. 13.9 ml	1	Antibiotics (3 d). No strenuous activity (4 wk). Lymphatic-drain massage after 7 days.
Sasaki[21]	Abdomen	MA	2.1 mm + 20 ml syringe	Centrifugation	PRP Saline	18-gauge + 1 ml syringe	Multiple incisions, retrograde, and fanning	Subdermal	10 ml	1	Elevate and minimize aggressive hand movements (1 wk)

Abbreviations: MA = manual aspiration; LD = liposuction device; NR = not reported; NS = not specified; SVF = stromal vascular fraction; PRP = platelet-rich plasma

Table 3
Results—Volumetric measurements

	Volume injected	Follow-up	Method of assessment	Result
Zhou et al.[19]	avg. 25.5 ml	avg. 8.3 months	Ultrasound	Soft-tissue thickness: Preoperative = 1.52 ± 0.53 mm Postoperative = 4.04 ± 0.70 mm Volume increase: avg. 10.3 ml (range 8-27.5)
			3D topography scanning	
Sasaki[21]	10 ml	12 months	3D Vectra analysis	Change from baseline: Saline group = 54.8 ± 53.8% PRP group = 89.2 ± 87.2%

used a retrograde, fanning/weaving injection technique with multiple passes in multiple directions via either single or multiple incisions[13-21]. Agostini et al. also injected the dorsum of the fingers[16]. The injection plane was not specifically reported in four articles[12, 14, 15, 17] and was in the subdermal or superficial layer in four articles[13, 16, 18, 21]. Zhou et al., however, transferred fat in both the superficial and deep layers[19] and Yun-Nan et al. in all three layers of the hand dorsum[20]. The volume of injected adipose tissue ranged from 10 to 39 ml. Mostly only one session of fat grafting was necessary to achieve the desired result. Postoperative management was very similar in all studies; patients were instructed to elevate and limit activities. Only two studies prescribed postoperative antibiotics[18, 20].

Volumetric measurements

Two studies used objective measurements to demonstrate effectiveness of AFT in hand rejuvenation[19, 21]. (Table 3) Zhou et al. demonstrated results by means of ultrasound and 3D topography scanning. After injecting on average 25.5 ml fat and after an average of 8.3 months follow-up, soft-tissue thickness was measured by ultrasound to be 1.52 ± 0.53 mm preoperatively and increased to 4.04 ± 0.70 mm postoperatively. Topography scanning revealed an average of 10.3 ml volume increase[19]. The study performed by Sasaki used 3D Vectra analysis after 12 months of follow-up to indicate a 54.8 ± 53.8% and 89.2 ± 87.2% change from baseline in the saline and PRP group, respectively[21].

Patient, Surgeon, and Independent observer evaluation

Seven studies evaluated patients' opinion on the final result (Table 4)[12, 14, 16-20]. In six studies, patient satisfaction is evaluated with two to 10-point Likert scales[12, 16-20]. Overall, self-reported satisfaction rate over a total cohort of 254 patients was very high with 97.6%.

In two articles, both patients and surgeons evaluated the final result[16, 19]. In the article written by El Kahky et al., the Merz Hand Grading Scale (MHGS) was used by patients and surgeons to evaluate the final result of treatment. An improvement in scores was clearly seen when comparing preoperative and postoperative figures[17]. Butterwick evaluated and asked their patients to evaluate the result regarding the prominence of veins and depth of the metacarpal space using a Four-point Likert scale. However, no preoperative scores are available to compare with[14]. Similarly, in the article by Butterwick et al., surgeons evaluated the results using the same scale. But again, no preoperative scores are available[15]. Lastly, in three studies, independent observers were asked to evaluate the result of treatment. By using three- or four-point Likert scales, clearly an improvement of aesthetic result was observed[16, 19, 21].

Complications

Of all included studies, nine reported on complications[12-16, 18-21]. Data from 300 patients are available (Table 5). Six studies reported some degree of postoperative oedema to be present in all patients[12, 13, 16, 19-21], whereas Fantozzi describes oedema to be present in only 3 patients[18] and two

Table 4
Results—Satisfaction

	No. Patients	Patient satisfaction/evaluation	Surgeon satisfaction/evaluation	Independent observer satisfaction/evaluation
		Two-, three-, or five-point scale		
Aboudib et al.[12]	72	Happy 98.6%/unhappy 1.4%	NR	NR
				Three-point scale
Agostini et al.[16]	22	Dissatisfied 4.5%/satisfied 13.6%/very satisfied 81.8%	NR	Not improved 0%/significantly improved 18.2%/very much improved 81.8%
Fantozzi[18]	65	Satisfied 84%/moderately satisfied 12%/dissatisfied 4%	NR	NR
				Four-point scale (0 = natural and smooth contour; 4 = serious atrophy)
Zhou et al.[19]	17	Very satisfied 58.9%/satisfied 35.3%/unsatisfied 5.9%		Preoperative = mean 2.65/postoperative = mean 0.95
		Five-point scale + MHGS		
Yun-Nan et al.[20]	68	Very satisfied 58.8%/satisfied 39.7%/neutral 1.5%/unsatisfied 0%/very unsatisfied0% + preoperative = mean 2.65 and postoperative = mean 0.97	NR	NR
		10-point scale (0 = unsatisfied, 10 = most satisfied) + MHGS (median (range))	**MHGS (median(range))**	
El Kahky et al.[17]	20 +SVF	10 (9.5-10) + preoperative: 3 (3-4), postoperative: 0 (0-1)	Preoperative: 4 (3-4), postoperative: 1 (0-1)	NR
	20 +none	10 (9-10) + preoperative: 3 (3-4), postoperative: 0 (0-1.5)	Preoperative: 3 (3-4), postoperative: 1 (0-2)	NR
				Four-point scale (preoperative -4 = severe loss of volume, 0 = no loss of volume/postoperative 0 = no change, +4 = significant improvement)
Sasaki[21]	10 +PRP	NR	NR	-2 ± 1.0/+2 ± 1.0
	10 +Saline			-2 ± 0.9/+2 ± 0.9
		Four-point scale (0 = not present; 3 = severely present)	**Four-point scale (0 = not present; 3 = severely present)**	
Butterwick[14]		Prominence of veins: Depression of metacarpal space:	Prominence of veins: Depression of metacarpal space:	NR
	14 Centrifugation			
	14 Decantation	1.75 1.0	1.75 1.0	
		2.08 2.0	2.08 2.0	
Butterwick et al.[15]		NR	Prominence of veins: Depression of metacarpal space:	NR
	10 Fresh			
	10 Frozen		2.00 1.4	
			1.00 1.1	

Abbreviations: SVF = stromal vascular fraction; PRP = platelet-rich plasma; MHGS = Merz Hand Grading Scale

Table 5
Results—Complications

	No. of patients	Complications (%)	Treatment
Aboudib et al. [12]	72	Infection (1.4%)	Antibiotics
		Irregularities (2.8%)	NR
		Oedema (100%)	NR
Coleman[13]	22	Oedema (100%)	Slight compression + elevation
Butterwick[14]	14	Infection (7.1%)	Antibiotics
		Temporary dysesthesia (21.4%)	NR
		Transient dusky discoloration (21.4%)	NR
Butterwick et al.[15]	10	Cysts (10%)	Steroid injections
		Temporary dysesthesias (30%)	NR
		Transient dusky discoloration (80%)	NR
Agostini et al.[16]	22	Sensory dysfunction fingers (13.6%)	Spontaneous recovery
		Oedema (100%)	Elevation
Fantozzi[18]	65	Temporary paraesthesia (10.8%)	Spontaneous recovery
		Oedema (4.6%)	NR
Zhou et al.[19]	17	Ecchymosis (17.6%)	Conservative
		Bumps (5.9%)	NR
		Oedema (100%)	NR
Yun-Nan et al.[20]	68	Oedema (100%)	NR
Sasaki[21]	10	Oedema, erythema, slight bruising, firmness, and tenderness (100%)	NR

Abbreviations: NR = not reported

other studies making no mention of perioperative oedema[14, 15]. Infection was seen in 2 patients (0.67%) and was treated by oral antibiotics. Cysts, irregularities, or bumps was seen in 4 patients (1.3%), temporary dysesthesia in 16 (5.3%), and transient dusky skin discoloration or ecchymosis in 21 patients (7%).

Discussion

A systematic review of the literature concerning the use of AFT in hand rejuvenation was conducted. The review was based on a broad search strategy, performed in three major medical databases. This study was performed to create a comprehensive review on current available evidence on the technique and outcome (effectiveness and safety) of AFT to rejuvenate the dorsum of the hand. Most articles regarding this topic are overview articles or technical notes[22-25], whereas only 10 articles were found to report on postoperative data.

When looking at the results regarding the fat grafting technique, great difference exists. Clearly, the technique of AFT in hand rejuvenation is variable among different surgeons. It is known that the entire procedure of fat harvest, processing, and re-injection affects the fat graft take, resorption, and final result of AFT. In general, the goal is to maintain as many viable adipocytes and stromal vascular fraction cells as possible (while discarding oil and blood) and to combine this with an optimal injection technique to increase fat graft survival. Many authors have been searching for the optimal technique; however, because of a lack of high-quality data, there is no evidence that supports the specific standardization of technique[26-28]. Today, we do know that after fat grafting, only the most peripheral layer of adipocytes survives the hypoxia, and globules with a radius of more than 1.6 mm will suffer from central necrosis[29, 30]. Therefore, fat graft delivery should be performed through many different cannula passes to leave small rays of microdroplets to achieve the best results. This innovation is also seen in the review: in the oldest article included in the review, fat was still injected in lumps and subsequently distributed over the hand dorsum, whereas in most articles, graft delivery was performed by retrograde injection, multiple cannula passes, and a fanning or weaving motion (Coleman technique) but only in the subdermal or superficial plane. In 2010, Bidic et al. highlighted the dorsal hand anatomy relevant to volumetric rejuvenation, and this resulted in surgeons injecting fat in multiple layers of the dorsal aspect of the hand, which could theoretically result in a more anatomical

restoration[19, 20, 31]. However, with current available data, we cannot reliably compare these injection techniques. Some authors[14, 15, 17, 21] compared different ways of fat preparation or enrichment by performing split treatments to both hands, but only small differences were noted.

When looking at patient outcomes, we consistently notice few complications and high satisfaction, irrespective of fat grafting technique. Major complications such as fat embolism or severe infection were not seen, indicating AFT in hand rejuvenation is a safe technique. Fat necrosis was not reported in any study. Postoperative oedema, although not reported in all studies, is expected to be present in all patients but is advocated by some authors not be seen as a complication, but rather as part of the operation[32].

Patient, surgeon, and independent evaluator satisfaction rates are generally high. Only the studies of Butterwick show less convincing figures; however, they are difficult to interpret because there are no preoperative figures. Satisfaction is subjective, and evaluations were performed using various Likert scales, which is a weakness. Only the MHGS is validated to grade the appearance of the dorsum of the hand[33]. Only two authors used the objective assessment of volume gain by ultrasound and/or 3D scanning, but they did reveal volume gain in all patients[19, 21]. Besides the volume augmentation, the fat's regenerative effect on the skin quality was reported by some authors; however, this was not properly measured in any study[16, 20].

An unpredictable graft resorption is the greatest drawback of AFT for volume augmentation purposes such as hand rejuvenation. Therefore, multiple fat transfer sessions might be necessary to achieve the desired result. Fat graft survival rates varies between 30 and 83% in the current literature[34]. In all included studies, graft resorption was never an outcome parameter. Anecdotally, Aboudib et al. mention moderate fat graft resorption after one year[12], and Yun-Nan et al. mention approximately 50% fat resorption after one session of AFT in his discussion[20]. Still, from volumetric measurements, some assumptions can be made regarding graft resorption. In the study by Zhou et al., an average of 25.5 ml of fat was injected, and after at least six months of follow-up, an average volume increase of 10.3 ml was demonstrated by 3D scanning. This indicates a fat graft survival of around 40%[19].

Another option to treat age-related volume loss to the dorsal aspect of the hand is the use of dermal fillers. Although high-quality clinical studies on AFT and hand rejuvenation are rare, several randomized clinical trials assessing the effectiveness of calcium hydroxylapatite (CaHA) and hyaluronic acid (HA) in hand rejuvenation have been published[35-38]. Several major differences are noted compared with AFT. First of all, the use of dermal fillers is a non-surgical treatment and does not require anaesthesia. The injection volume is much lower and rarely exceeds 3 ml per hand. Different injection techniques are used. Effects are temporary; thus, frequent touch ups are not unusual. Lastly, in these articles, satisfaction rates are high, and only mild complications are seen, which is similar to AFT[35-38]. Nevertheless, foreign-body granulomas is a known and severe complication of dermal fillers and is also described after hand rejuvenation. Treatment often requires surgical excision[6].

This systematic review has several limitations. First, most studies included in the review are case series, which are inherently low-quality articles. Secondly, in most articles, patient cohort sizes are small, and follow-up was short. Thirdly, the patient- or surgeon-reported satisfaction is measured using various nonvalidated Likert scales, and objective data on volume retention were present in only two studies. Also, there is heterogeneity in technique and reported outcomes, making it difficult to combine data and draw conclusions. Furthermore, regarding the reporting of complications, it is important to mention that some authors use different definitions of a complication. For example, postoperative oedema is reported by some authors to be present in all cases, whereas other authors made no mention of this at all. It is assumed that some authors did not consider this as a true complication. Lastly, there is an inherent bias for publication of positive results. Obviously, all of these limitations may bias the results of this systematic review, and further evidence will be welcome.

Conclusion

In conclusion, this systematic review summarizes the current evidence on the technique and outcome of AFT in hand rejuvenation. Although several limitations exist, by combining the current evidence, AFT is considered a promising and safe technique to rejuvenate the aging hand with very high

patient satisfaction. AFT has several advantages related to biocompatibility and longevity; however, the drawback of fat graft resorption, which is inherent to AFT in any indication, should be taken into account. Also, one single optimal technique cannot be recommended above others. Future research, using validated patient questionnaires, objective volumetric measurements, and longer follow-up, is needed to confirm these results.

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none declared

Ethical approval

not required

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