

R E V I E W

Squamous cell carcinoma of the scalp: Analysis of reconstructive techniques

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Abstract. *Background and aim:* Surgical therapy of squamous cell carcinomas (SCC) is based on complete excision of the neoplasm and its immediate suitable reconstruction. The aim of this work was to evaluate the possibility of creating a reconstructive algorithm in cases of scalp SCC, depending on the amplitude of the tumour, based on a literature's review. *Methods:* A literature search was carried out using the databases of Pubmed, Scopus and Cochrane. *Results:* Based on the experiences reported in the literature, it was possible to structure a decision-making algorithm that summarizes the various steps involved in the choice of the most suitable reconstructive surgical therapy. *Conclusions:* The algorithm described we hope will be of reference or help to less experienced reconstructive plastic surgeons. (www.actabiomedica.it)

Key words: squamous cell carcinoma, scalp, reconstructive techniques

Introduction

Surgical therapy of squamous cell carcinomas (SCC) is based on complete excision of the neoplasm and its immediate suitable reconstruction (1). In the case of localizations of the scalp, the surgeon must take into account its peculiar morphological and biomechanical characteristics (2-4). Regarding the former, the most important feature is the presence of hair (5). If the removal takes place in the context of an area surrounded by hair, this significantly affects the choice of the reconstructive technique to be preferred with the aim of obtaining an aesthetically satisfactory result. Regarding the latter, the peculiar presence of the galea aponeurotica (with its precise biomechanical properties) significantly affects the mobility of local flaps (6-9). Both these factors can condition or limit the reconstructive possibilities that can be proposed and/or planned. The aim of this work was to evaluate

the possibility of creating a reconstructive algorithm in cases of scalp SCC, depending on the amplitude of the tumour, performing a literature's review.

Materials and methods

Search criteria

The research was carried out in June 2023 using the databases of Pubmed, Scopus and Cochrane. No date limits were set. The keywords used for the bibliographic research were "squamous cell carcinoma" AND "scalp reconstruction". These broad search terms together with related articles of the resulting primary search were used to identify all citations reporting reconstructive strategies for scalp defects after excision of SCC of the scalp. Results were analyzed, and double

references were excluded. A list of articles for review was generated. Additional articles were included by reviewing the reference list of the relevant abstract. This study was conducted according to PRISMA guidelines for systematic reviews.

Selection criteria

Inclusion and exclusion criteria were defined before searching to avoid selection bias.

Inclusion Criteria

- Adult human subject;
- English language;
- Diagnosis of SCC of the scalp region;
- Size of the scalp defect;
- Studies that include different diagnoses for which it is possible to attribute a surgical reconstructive strategy (eg, a case series of a different diagnosis but with the same reconstructive strategy) and a relative outcome to SCC patients.

Exclusion criteria

Studies that include different diagnoses for which it is not possible to attribute a surgical reconstructive strategy to SCC patients.

Results

A total of 29 citations from PubMed, 41 from Scopus, and 0 citations from Cochrane Library were initially identified, and 56 records were considered relevant. Full-text examination excluded further 36 articles. Twenty articles of the initial research, published from 1998 to 2023, fulfilled the inclusion criteria and were included in the systematic review (10-29). All the 20 selected studies (Table I) involved a retrospective analysis: 12 were case series and 8 were case reports. In particular, among case series, only patients who met the inclusion criteria were considered and included in our review. A total of 139 patients were included in the

studies on scalp defect reconstruction after excision of SCC with different surgical techniques. The sample size of each study ranged from 1 to 28 SCC patients. Type of reconstruction and complications were considered. (Table 1.)

Reconstruction strategies

The reconstruction methods described in the selected articles ranged from skin grafting, whether or not preceded by artificial dermis, to local flaps, pedicled flaps and free flaps. Complications were rare (8 pt, 5.8%): 1 hematoma, 1 seroma, 3 partial graft loss, 3 partial flap necrosis.

Proposed operative algorithm

Based on the experiences reported in the literature, it was possible to structure a decision-making algorithm that summarizes the various steps involved in the choice of the most suitable reconstructive surgical therapy (Figure 1).

Given the peculiar biomechanical characteristics of the scalp, it is usually possible to directly close excisions of areas up to 4 cm², without tension. In these cases, galeotomies (30-31), galeal flaps (32-34), and extenders (35-40) can be used profitably as ancillary methods. For medium defects (areas from 4 cm² to 40 cm²), the choices to be considered range from the use of local flaps (V-Y, O-Z, keystone, superficial temporal perforator) or artificial dermis plus skin grafts.

For larger defects, free tissue transfer (LD, ALT) should be, whenever possible, the preferred choice, particularly in the case of previous RT or calvaria defect. The algorithm we propose is summarized in Figure One.

In the case of medium defects, it remains to underline the undeniable value of tissue expansion (41-48), even if not included in the papers considered.

Discussion

Scalp defects require prompt resolution which, to be optimal, must meet functional and aesthetic

Table 1.

Authors	Year	Number of patients	Surgical technique	Complications
Ronel et al ¹⁰	2004	1	SG	-
Cho et al ¹¹	2017	9	FLD	1 hematoma 1 seroma 3 partial SG loss
Lu et al ¹²	2021	1	CF	-
Tran et al ¹³	2022	1	TE + ADM + OF	-
Halvorson et al ¹⁴	2009	28	FF	-
Lembo et al ¹⁵	2020	6	ADM	-
Thornton et al ¹⁶	2006	7	FLD	-
Carey et al ¹⁷	2012	1	FLD	-
Simunovic et al ¹⁸	2016	14	FLD - ALT	-
Rysz et al ¹⁹	2017	28	PC - SG - LF - FF	-
De Angelis et al ²⁰	2015	20	AD	-
Weitz et al ²¹	2019	17	FF	1 partial necrosis 1 venous insufficiency
Marijon et al ²²	2013	3	FF	2 partial necrosis
Vardaxi et al ²³	2023	1	SG	-
Papadopoulos et al ²⁴	2009	2	LF	-
Haddock et al ²⁵	2011	1	ALT	-
Jones et al ²⁶	1998	1	AMF	-
Ronel et al ²⁷	2004	1	SG	-
Bejinariu et al ²⁸	2020	1	LF	-
Aldabagh et al ²⁹	2014	16	SG - LF	-

Abbreviations: SG = Skin Graft; FLD = Free Latissimus Dorsi; CF = Crane Flap; TE = Tissue Expansion; ADM = Artificial Dermal Matrix; OF = Orticochea Flap; FF = Free Flap; ALT = AnteroLateral Thigh; PC = Primary Closure; LF = Local Flap; AMF = Allogeneic Muscle Flap.

requirements. The scalp is characterized by specific functional and aesthetic peculiarities. From the biomechanical point of view, the presence of the galea aponeurotica (which is an integral part of the locally transposed flaps) significantly affects the elasticity of the flaps, limiting their smoothness. When indicated, to obtain an aesthetically valid result, the presence of hair should be for the possible restored. The proposed algorithm is the result of the critical analysis of the extensive case studies reported in the literature. However, in clinical practice, several other factors (such as individual elasticity of the scalp, patient demands, etc.) must obviously be considered in an attempt to obtain an optimal result.

Conclusions

We hope that the algorithm described will be of reference or help to less experienced reconstructive plastic surgeons who are faced with the not simple task of reconstructing a defect of the scalp.

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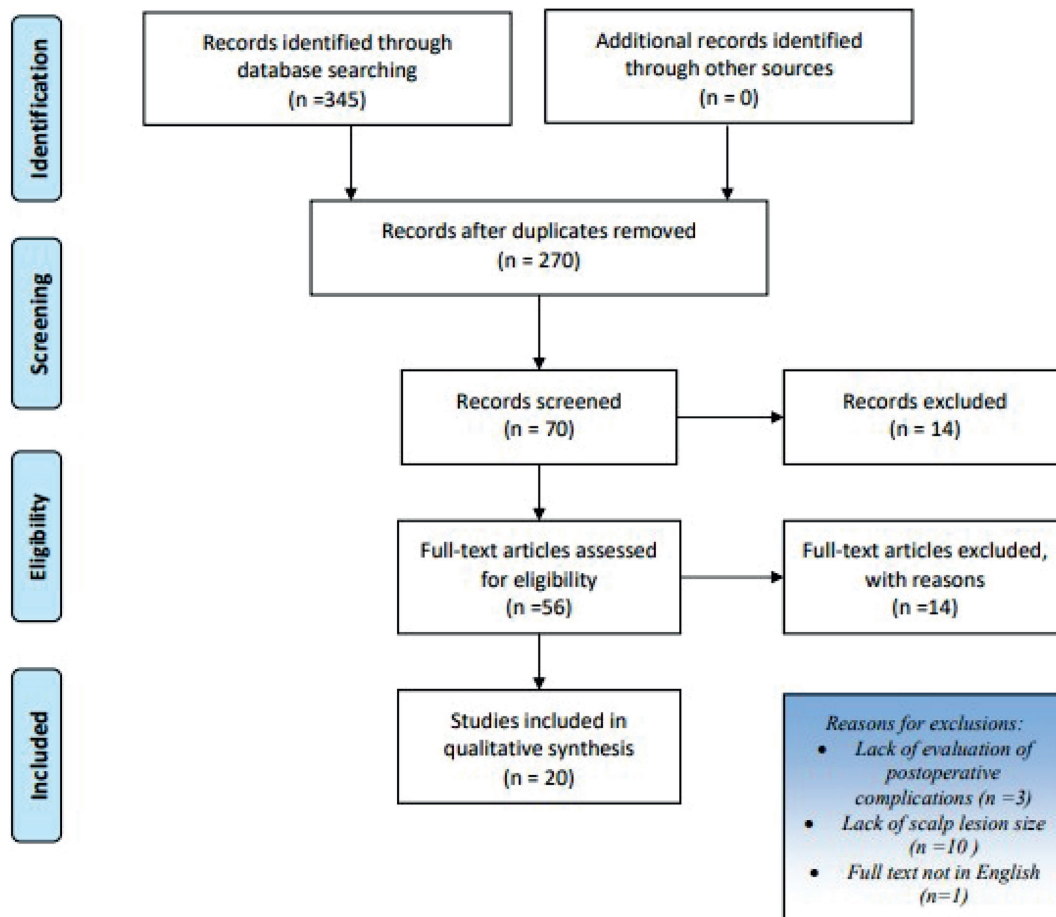


Figure 1. The proposed algorithm for scalp reconstruction.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: GR wrote the paper, AG – IB – AA performed the research, ER supervised the work.

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