



# Management of self-inflicted gunshot wounds to the face: retrospective review from a single tertiary care trauma centre

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## Abstract

There are limited published data about the surgical management of self-inflicted facial gunshot wounds. The aim of this retrospective study was to review our management of subjects who initially survive such a wound and were admitted to a tertiary care trauma centre between 2002 and 2012. Only subjects with definitive evidence of a self-inflicted facial gunshot wound and who were admitted alive were included. Data collected included personal and clinical details, characteristics of the gunshot wound, and medical and surgical management. Types of operations and their duration were recorded, and primary reconstruction was divided into early (within the first 48 hours after presentation) or delayed (longer than 48 hours). Determinants of infection were assessed with univariate analysis.

Seventy-six subjects (65 male and 11 female, mean (range) age 44 (18–83) years) were included in the study. Twenty-five patients needed an early surgical airway and five needed emergency intervention to control haemorrhage. Forty-five patients had primary reconstructions (28 early and 17 delayed) and 12 who were treated by delayed repair had a submental entry site to the wound. There were no significant differences in infection rates between those who had early, compared with those who had late, reconstructions.

Early primary reconstruction can be successful for patients with self-inflicted facial gunshot wounds, particularly when the entry point of the bullet is in the upper and midface area. Delayed primary reconstruction was more common when the bullet entered the lower face.

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## Introduction

Self-inflicted facial gunshot wounds can result in devastating injuries to the facial structures and have a high mortality.<sup>1</sup> They are particularly distressing injuries, and not just for the patient. The psychological milieu of the injury means that the mindset of the surgeon must be considered as well as that

of the patient, because of the strong emotion evoked by the nature of the injury.

Early primary reconstruction has been advocated for the management of facial gunshot wounds that result from civilian interpersonal violence,<sup>2</sup> but its merits and feasibility have not been investigated in isolated, self-inflicted, facial gunshot wounds. In contrast to most facial gunshot wounds that result from interpersonal violence, the weapon is held in close proximity to the face in self-inflicted wounds, which could potentially affect the outcomes of early primary reconstruction. The potential impact of the surgeon's misgivings must be acknowledged because of the self-inflicted nature of the

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injury and the complexity of the reconstructive surgery,<sup>3</sup> but this should not be a reason for delaying primary reconstruction.

The purpose of this study was to analyse retrospectively the management of subjects who were seen with self-inflicted facial gunshot wounds at a tertiary care centre. The investigators hypothesised that the principles of early primary reconstruction could be successfully used in their management.

## Methods

The institutional ethics review board approved this retrospective study. The group studied comprised all subjects who presented to a tertiary care trauma centre with a self-inflicted facial gunshot wound between January 2002 and December 2012.

To be included subjects had to be alive on arrival with definitive evidence of a self-inflicted facial gunshot wound (history, eye witness's account, opinion of law enforcement officer, necropsy report, or strong medical opinion). The necropsy report (if available) was used if the subject initially met the inclusion criteria but subsequently died during admission. The face was defined as from the top of the forehead to the chin and anterior to the external auditory canal. Subjects were excluded if the facial gunshot wound was not self-inflicted, if they arrived after being pronounced dead, or if they were younger than 18 years of age.

Data were collected by review of the relevant medical records, radiological findings, operative reports, consultation reports, and, if the subject died after admission, the necropsy report. The subjects' age and sex were recorded. All subjects had blood toxicology analyses (alcohol, opioids, cannabinoids, and cocaine), which were reviewed and recorded. Gunshot wounds were classified based on the entry site of the bullet into submental, intraoral, or frontal scalp. Avulsive gunshot wound injury was classified as substantial tissue loss secondary to the gunshot wound, which was confirmed by reviewing imaging and necropsy reports, as applicable. Surgical treatments, including their timing, were also reviewed. Removal of necrotic tissue, stabilisation of the underlying bone by any accepted method, and approximation of the soft tissue envelope, was defined as primary reconstruction and was further defined as early or delayed depending on whether it was done within 48 hours of presentation or later. Drugs including antibiotics were recorded.

The primary outcome assessed was the feasibility of early primary reconstruction and any association of infection in relation to its timing. Other outcomes assessed were death, discharge to rehabilitation, or discharge home. The significance of differences between categorical variables was assessed with the Chi squared test, and we used binary logistic regression with wound infection as the dependent variable. Probabilities of less than 0.05 were accepted as significant,

Table 1

Summary of surgical interventions and outcome based on the entry site of the gunshot wound.

Variable	Submental (n = 29)	Intraoral (n = 34)	Frontal (n = 13)	p value
Primary reconstruction:				0.18
Early (<48 hours)	12	14	2	
Late (48 hours or more)	12	4	1	
Operations done:				
Serial debridement	5	2	0	
ORIF of fractures	16	10	2	
Free flap	6	5	0	
Regional flap	0	3	1	
Tracheostomy	15	12	1	
Gastrostomy	13	9	1	
Frontal sinus	2	4	1	
Orbital enucleation	2	2	0	
Craniotomy	4	4	2	
Outcome:				0.001
Discharged home	2	4	0	
Discharged to rehabilitation	24	14	3	
Death	4	15	10	

ORIF = open reduction with internal fixation.

and all analyses were done with the aid of IBM SPSS Statistics for Windows (version 22, IBM Corp, Armonk, NY, USA).

## Results

A total of 76 subjects, 65 men and 11 women (mean (range) age 44 (18–83) years) met the inclusion criteria, 29 of whom died, 13 within 24 hours of presentation. None of those who died within 24 hours was operated on. Significantly more subjects with submental and intraoral entry sites survived the first 24 hours ( $p = 0.001$ ). Table 1 gives a summary of interventions and outcomes. Emergency control of haemorrhage was by interventional radiology ( $n = 3$ ) or in the operating theatre ( $n = 2$ ). Packing was used to control haemorrhage in the remainder of subjects once a definitive airway had been established. Toxicology results showed that 38 subjects had been under the influence of alcohol or an illicit substance when they attempted suicide.

Twenty-nine subjects were not operated on, and six of these survived. Early primary reconstruction was carried out in most cases, with the lowest number being 12 in those with a submental gunshot wound. Internal rigid fixation was used in all but three subjects as part of primary reconstruction. Intermaxillary fixation was used in two subjects (one with a comminuted mandibular fracture and one with a fractured maxilla), and one had an external fixation device for a comminuted mandibular fracture. Eleven free flaps were used (mean day 21, range 5–67). Two free flaps placed for the same patient on day 11 failed, and the subject eventually had a successful free flap on day 67.

Univariate logistic regression analysis showed that neither early nor late reconstruction was predictive of infection,

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