Psychosocial sequelae and correlates of orofacial injury

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The growing recognition of violence-related injury as a major public health problem has garnered attention to its differential impact on vulnerable populations. Numerous studies evidence that traumatic injury of assaultive origin exerts its greatest impact on young, minority males. Following an analysis of 46,240 injury events recorded over a 4-year period in an urban African American population, Schwarz et al [1] found intentional injuries to account for 31.2% of hospital admissions. More disturbing, the devastating effect of intentional injury in vulnerable populations is only exacerbated by the ever-present expectation that it will occur and recur [2,3]. Schwartz et al [1] determined that 94.3% of minority men between the ages of 20 and 29 years had visited an emergency department at least once in the past 4 years because of an injury, with 41% seeking treatment more than once for intentional injuries.

Orofacial injury is a significant, yet mostly underappreciated, aspect of the injury burden borne by our vulnerable populations. Orofacial injury is worthy of special emphasis because it occurs in high frequency, disproportionately affects vulnerable populations [4–6], involves an anatomical region

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that largely defines perceptions of self-image and identity [7], is often associated with persistent disabilities [8], and expends the majority of dental/oral surgical services provided by public hospitals [9]. Unfortunately, treatment is geared entirely toward tending to the overt physical manifestations of the injury; less evident psychosocial sequelae are rarely considered. A growing body of literature indicates that common reactions to traumatic injury include symptoms of repeated and unwanted experiencing of the event, hyperarousal, anxiety, and a persistent sense of current threat. In many trauma patients, the constellation of symptoms may be intrusive enough to meet the diagnostic criteria for Posttraumatic Stress Disorder (PTSD), and capable of impairing their social and occupational functioning for extended periods. Oddy and Humphrey [10] found that head-injured patients evidenced disrupted social relationships for as long as 2 years after injury.

Although the index traumatic event, by itself, can potentially trigger persistent symptoms in a broad group of patients, researchers have identified several personal and environmental factors that increase the risk of exposure to traumatic events and heighten susceptibility to the development of PTSD. Putative risk factors include being male, being socioeconomically disadvantaged, having low education levels, and having behavioral and substance use problems. This also happens to be the typical profile of patients seeking care for assaultive facial injury at our public hospitals. Hence, there is a great need to expand the care of facial injuries in vulnerable populations to include consideration of evolving psychosocial sequelae and to investigate and quantify these difficulties. Understanding the relative impact of these biopsychosocial factors and how they mitigate or exacerbate the stress of injury is an important first step toward providing comprehensive care and developing targeted interventions for these individuals.

The University of California at Los Angeles/Drew Regional Research Center for Minority Oral Health experience

Conducted under the aegis of the University of California at Los Angeles /Drew Regional Research Center for Minority Oral Health, our ongoing investigations of patients seeking treatment for orofacial injuries at the Martin Luther King/Charles Drew Medical Center (KDMC) provided a unique opportunity to study prospectively the psychosocial sequelae and correlates of orofacial injury. The KDMC is the prototype inner-city hospital—a publicly funded institution serving the indigent, predominantly minority populations of South Central Los Angeles. The ethnic composition (predominantly African American and Hispanic) and limited access to ongoing medical and dental care render this population especially informative in revealing the prevalence and sequelae of traumatic exposure in this understudied vulnerable population.

Our study used a posttest only, repeated-measures, control group design. All adult patients presenting with a mandible fracture to the KDMC

between August 1996 and December 2001 were considered eligible for inclusion. Patients with gunshot injuries or altered mental status attributable to head injuries, or who were mentally incompetent were excluded, as were patients who were unable or unwilling to return for follow-up care. To study differentials in risky behavior and psychosocial outcomes, the injury cohort was compared with a control cohort of 119 sociodemographically matched patients undergoing elective oral surgery (wisdom tooth surgery) at the same hospital. In addition to the surgical treatment, eligible patients who consented were interviewed at regular intervals for a 1-year period by research staff. Participants were administered structured questionnaires that included items regarding sociodemographic characteristics, and various psychosocial measures including the Brief Symptoms Inventory (BSI) [11], the Posttraumatic Stress Diagnostic Scale (PDS) [12], and the Service Use and Adjustment Problem Screen (SUAPS) [13]. The first of the postdischarge surveys was conducted within 10 days of hospital discharge, the second at the 1-month recall appointment, the third approximately 6 months postdischarge, and the fourth approximately 1 year postdischarge.

Patient characteristics

The majority of the 336 patients treated for mandible fractures were young (71% were < 40 years), single (84.5%), minority (73% African American and 22% Hispanic) males (89%). Less than 10% had more than a high school education, 39% had not completed high school. Nearly three fourths of the patients were unemployed at the time of their injury and almost all were medically indigent. Over 83% of the orofacial injuries resulted from interpersonal assault, with nearly one third of these patients reporting a previous traumatic injury. On average, each patient stayed in the hospital for 3 days and generated hospital charges of approximately $11,000.

Risk factors for injury and recurrent injury

Because 31.4% of the injured patients reported a previous trauma requiring medical attention, we investigated putative behavioral risk factors for injury and reinjury. We found that orofacial injury patients were more likely than were their matched cohorts to report habitual use of alcohol (odds ratio [OR] of 5, 95% confidence interval [CI] from 2.24–11.17) and drugs (OR of 8, 95% CI from 2.42–25.73). In response to a CAGE questionnaire [14], 51% of the injury cohort gave positive response to at least one of the CAGE questions—strongly suggesting at-risk drinkers. Furthermore, 31.3% gave a positive response to two or more CAGE questions suggesting problem/alcohol dependent drinkers. In general, injury cohort patients were five times more likely than were patients in the control group to be problem/alcohol dependent drinkers (95% CI from 2.30–8.65, $P < 0.001$). These data reinforce the close association between substance use and injury in general, and orofacial injury in particular [6,15,16].

Presenting psychological distress and service needs

As indexed by the BSI and the SUAPS, orofacial injury patients evidenced higher levels of lifetime exposure to traumatic events and high levels of acute distress postinjury. Eighty-six percent of the orofacial injury sample reported lifetime exposure to at least one prior traumatic event, with the most common events being physical assault (45.6%) and involvement in a serious accident (19.3%). Additionally, the injury patients were significantly more likely to have a lifetime mental health and/or service need, and a current mental health and/or service need (Table 1). Among the injured cohort, the highest need rates were with regard to having a drinking problem (26% reported past and/or current problem), having a drug problem (26.4% reported past and/or current problem), and homelessness (36.3% reported past and/or current homelessness). Despite the greater need, current service use rates reported by all patients were low (approximately 10%) and did not differ between the orofacial injury and comparison cohorts. This large disparity emphasizes the significant unmet mental and service needs in at-risk patients, particularly in those presenting with orofacial injury.

The average scores for almost all subscales of the BSI were significantly higher for the trauma patients than for their sociodemographically matched controls (Table 2). Orofacial injury patients were more likely to endorse a higher mean number of symptoms (eg, depression, anxiety, and hostility) than were their sociodemographically matched controls. Table 3 shows the proportion in each group exceeding a cutoff point (the cutoff point was determined by identifying symptoms endorsed by 14–20% of the injury group). There was a fivefold increase in the number of orofacial injury patients reporting multiple depressive symptoms compared with their matched controls; for anxiety and hostility symptoms, there was a twofold increase. These unadjusted bivariate logistic regression results illustrate that the orofacial injury group is at higher risk with respect to these various mental health measures. Our results suggest that a significant proportion of patients presenting with orofacial injury to our safety-net hospitals have underlying psychopathology. Their facial injuries may be markers of risk-taking behaviors. Among other behaviors, the high and sustained levels of hostility may make them more vulnerable to recurrent injury.

Table 1
Current and lifetime mental health need and service need/use

	% Injury cohort (n = 336)	% Comparison cohort (n = 119)	Chi-square P value
Current mental health need	37.7	17.1	0.001
Lifetime mental health need	55.2	32.5	0.001
Current service need	50.2	25.6	0.001
Lifetime service need	80.1	50.4	0.001
Current service use	12.8	11.1	0.739
Lifetime service use	29.9	23.1	0.179

Table 2
Mental Health Status: Brief Symptom Inventory (BSI)

BSI	Injury cohort (n = 336)	Comparison cohort (n = 19)	Chi-square P value
Depression	0.5836	0.3462	0.001
Obsessive/compulsive	0.6149	0.4958	0.075
Anxiety	0.6166	0.4132	0.001
Hostility	0.6416	0.3866	0.001
Phobia	0.5290	0.3345	0.003

Psychological sequelae

We utilized repeat administration of the PDS to examine temporal changes in psychological functioning subsequent to the traumatic injury. Developed specifically as a brief instrument that would help provide a reliable diagnosis of PTSD, this self-report scale assesses current intensity/frequency ratings of 17 symptoms. The structure and content of the PDS mirror the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) [17] diagnostic criteria for PTSD. The PDS includes items that assess objective and subjective responses to the circumstances of the traumatic injury, symptom severity, and likely PTSD diagnosis resulting from the injury. Using the PDS, we determined PTSD-positive cases at 1-month postinjury (the acute phase), and 12 months postinjury (the chronic phase). Based on a review of the literature, we focused on five domains of possible predictors of subsequent high levels of traumatic stress: (1) socio-demographics, (2) psychological difficulties prior to the trauma, (3) prior traumatic exposure, (4) exposure characteristics from the orofacial injury, and (5) resources available in the early recovery phase.

Acute sequelae

Scores on the PDS for the facial injury patients were compared with those obtained from the normative group that consisted of 248 mental health treatment seekers throughout the United States who reported they had been confronted with a traumatic event a minimum of 1 month before [12]. The PDS scores (M = 30.37, SD = 11.43) for the 287 patients returning for the

Table 3
Relative symptomatology

	% Injury cohort	% Comparison cohort
Depression	**16.1**	**2.5**
Obsessive/compulsive	16.8	11.8
Anxiety	**14.6**	**5**
Hostility	**15**	**6.7**
Phobia	13.6	9.4

Bold indicates proportion exceeding cut-off point.

1-month recall appointment was much higher than the national norms
($M = 23.41$, $SD = 14.68$), indicating more symptoms and greater distress.
Sixty-eight of the facial injury patients (25%) endorsed symptoms consistent
with a current chronic PTSD diagnosis, utilizing the criteria specified by Foa
[12]. Tables 4 through 6 summarize the results of the univariate tests of
variables associated with the development of acute PTSD symptoms. Of the
various demographic variables, age and gender were predictive of higher
PTSD symptoms, with older individuals and females having worse psy-
chological outcomes at 1-month postinjury (see Table 4). As expected,
prior psychological disturbances, reflected in the lifetime and current
mental health need and lifetime social service need and use reported by
patients, were predictors of high rates of PTSD symptoms (see Table 5).
A prior exposure to a trauma, meeting DSM-IV diagnostic criterion for ob-
jective and subjective exposure to that trauma, and high rates of stressful life

Table 4
Univariate associations with Posttraumatic Stress Disorder symptom total at 1 month

Demographics	Posttraumatic Stress Diagnostic Scale Mean (SD)	Univariate test of statistical significance
Age group		
18–29 (n = 105, 36.6%)	27.44 (10.57)	$F(2, 284) = 5.81$, $P < 0.01$[a]
30–31 (n = 100; 34.8%)	31.59 (12.09)	
40+ (n = 82, 28.6%)	32.63 (11.03)	
Gender		
Male (n = 255, 88.9%)	29.68 (11.09)	$t(285) = 2.93$, $P < 0.01$[a]
Female (n = 32, 11.1%)	35.88 (12.84)	
Employment status		
Unemployed (n = 195, 67.9%)	31.06 (12.20)	$t(22.3) = 1.63$, $P = 0.10$
Employed (n = 92, 32.1%)	28.90 (9.56)	
Education		
Less than high school (n = 108, 37.6%)	29.69 (11.40)	$t(285) = 0.78$, $P = 0.44$
More than high school (n = 179; 62.4%)	30.78 (11.48)	
Ethnic group		
African American (n = 207, 72.1%)	30.98 (11.55)	$F(2, 284) = 1.07$, $P = 0.34$
Hispanic (n = 64, 22.3%)	28.69 (10.61)	
Other (n = 16, 5.6%)	29.19 (13.19)	
Marital group		
Currently married (n = 48, 16.7%)	29.25 (11.67)	$F(2, 284) = 0.89$, $P = 0.41$
Never married (n = 191, 66.6%)	30.18 (11.40)	
Widowed/separated/ divorced (n = 48, 16.7%)	32.37 (11.42)	

[a] *N* varies due to missing data.

Table 5
Univariate associations with Posttraumatic Stress Disorder (PTSD) symptom total at 1 month

	Post-traumatic stress Diagnostic Scale Mean (SD)	Univariate test of statistical significance
Psychological difficulties prior to injury		
Lifetime social service need		
Yes (n = 205, 79.8%)	31.33 (11.9)	$t(93) = 3.25$, $P < 0.002$[a]
No (n = 52, 20.2%)	26.17 (9.8)	
Lifetime social service use		
Yes (n = 75, 29.2%)	34.11 (12.92)	$t(255) = 3.44$, $P < 0.001$[a]
No (n = 182, 70.8%)	28.71 (10.8)	
Current mental health need		
Yes (n = 95, 37.0%)	33.74 (12.72)	$t(169) = 3.54$, $P < 0.001$[a]
No (n = 162, 63.0%)	28.56 (10.53)	
Lifetime mental health need		
Yes (n = 139, 54.1%)	32.91 (12.65)	$t(253) = 4.12$, $P < 0.001$[a]
No (n = 118, 45.9%)	27.19 (9.70)	
Likely alcohol problem		
Yes (n = 135, 62.5%)	29.69 (11.10)	$t(214) = 0.78$, $P < 0.44$
No (n = 81, 37.5%)	30.94 (12.02)	
Prior traumatic exposure and stressors		
Prior exposure to a trauma		
No (n = 40, 14.9%)	24.70 (7.60)	$t(77) = 4.68$, $P < 0.001$[a]
Yes (n = 228, 85.1%)	31.43 (11.92)	
Meet subjective distress diagnostic criteria for prior trauma		
No (n = 106, 43.6%)	27.37 (10.55)	$t(241) = 4.27$, $P < 0.001$[a]
Yes (n = 137, 56.4%)	33.72 (12.20)	
Likely PTSD from prior event		
No (n = 254, 94.8%)	30.36 (11.60)	$t(266) = 0.38$, $P < 0.71$
Yes (n = 14, 5.2%)	31.57 (12.45)	
Sum of stressful like events in past year		
	14.74 (6.20)	$r(270) = 0.28$, $P < 0.001$[a]

[a] *N* varies due to missing data.

events in the prior year were strongly predictive of higher PTSD symptoms from the facial injury (see Table 5). In terms of exposure characteristics, high rates of pain at admission and 10 days postinjury and high rates of psychological distress at discharge were related to higher rates of acute PTSD symptoms. Finally, lack of both emotional and instrumental support and current social service need and use in the immediate recovery phase were related to higher levels of psychological symptoms at 1 month (see Table 6).

A simultaneous multiple regression model incorporating these 18 statistically significant predictors was significant, $F(29, 185) = 3.86$, $P < 0.001$; $R^2 = 0.38$. The six variables accounting for statistically significant independent variance in the regression model were age over 40 years ($\beta = 0.19$, $P < 0.02$), being female ($\beta = -0.14$, $P < 0.03$), having an intense negative response to a prior trauma ($\beta = 0.14$, $P < 0.04$), pain level 10 days postinjury ($\beta = 0.19$, $P < 0.005$), need for more emotional support 10 days postinjury

Table 6
Univariate associations with Posttraumatic Stress Disorder symptom total at 1 month

	Posttraumatic Stress Diagnostic Scale Mean (SD)	Univariate test of statistical significance
Exposure characteristics		
Cause of injury		
Assaultive (n = 234, 82.1%)	30.75 (11.43)	$t(283) = 1.41$, $P = 0.16$
Accident (n = 51, 17.9%)	28.27 (11.21)	
Pain on admission (0–10)	6.61 (2.72)	$r(285) = 0.13$, $P < 0.03$[a]
Pain at 10 days post (0–10)	366 (3.23)	$r(264) = 0.311$, $P < 0.001$[a]
Surgeon-judged injury severity (0–28)	6.04 (2.27)	$r(285) = 0.10$, $P < 0.10$
Overall distress at discharge	13.32 (3.98)	$r(281) = 0.20$, $P < 0.001$[a]
Coping resources post injury		
Current social service need		
Yes (n = 126, 49.0%)	32.67 (12.7)	$t(240) = 3.26$, $P < 0.001$[a]
No (n = 131, 51.0%)	27.99 (10.2)	
Current social service use		
Yes (n = 32, 12.5%)	36.59 (12.8)	$t(255) = 3.33$, $P < 0.01$[a]
No (n = 225, 87.5%)	29.39 (11.3)	
How much more instrumental support needed? (rated 10 days postdischarge)		
A lot more (n = 33, 12.4%)		$r(269) = -0.17$, $P < 0.005$[a]
Some more (n = 51, 19.2%)		
A little more (n = 52, 19.5%)		
No more (n = 130, 48.9%)		
Anyone to count on for instrumental support? (rated 10 days postdischarge)		
no (n = 45, 16.6%)		$r(264) = -0.28$, $P < 0.001$[a]
no need (n = 9, 3.3%)		
Yes (n = 217, 80.1%)		
How much more emotional support needed? (rated 10 days postdischarge)		
A lot more (n = 33, 12.3%)		$r(269) = -0.17$, $P < 0.005$[a]
Some more (n = 54, 20.1%)		
A little more (n = 40, 14.9%)		
No more (n = 141, 52.6%)		
Anyone to count on for emotional support? (rated 10 days postdischarge)		
No (n = 31, 11.4%)		$r(264) = -0.36$, $P < 0.001$[a]
No need (n = 6, 2.2%)		
Yes (n = 234, 86.3%)		

[a] $N \neq 287$; N varies due to missing data.

($\beta = -0.26$, $P < 0.01$), and high rates of stressful life events over the past year ($\beta = 0.18$, $P < 0.02$).

Chronic sequelae

The mean PDS score for the 193 participants (57% of original cohort) who returned for the 12-month follow-up was 27.43 (SD = 11.44). As with the 1-month data, this average was much higher than that of the PDS normative sample discussed above. Forty-two injury patients (22%) endorsed

symptoms consistent with a PTSD diagnosis, utilizing the criteria specified by Foa [12]. Results of univariate tests of variables associated with the development of chronic PTSD symptoms are summarized in Tables 7 through 9. Sociodemographics no longer appeared to contribute to the prediction of PTSD symptoms. Prior psychological disturbances, however—as reflected in lifetime and current mental health need and lifetime social service need and use—continued to serve as predictors of high rates of chronic PTSD symptoms. Additionally, previous exposure to a trauma and high rates of stressful life events in the prior year were still strongly predictive of higher chronic PTSD symptoms from the orofacial injury. In terms of exposure characteristics, high rates of pain 10 days postinjury were related to higher rates of PTSD symptoms at 12 months. Finally, lack of both emotional and instrumental support in the immediate recovery phase and current perceived need for social services were related to higher levels of symptoms at 1 year.

Table 7
Univariate associations with Posttraumatic Stress Disorder symptoms total at 12 months

Demographics	Posttraumatic Stress Diagnostic Scale Mean (SD)	Univariate test of statistical significance
Age group		
18–29 (n = 65, 33.7%)	27.58 (10.71)	$F_{(2, 191)} = 0.49$, $P = 0.61$
30–31 (n = 72, 37.3%)	26.47 (11.20)	
40+ (n = 56, 29.0%)	28.48 (12.63)	
Gender		
Male (n = 169, 87.6%)	27.04 (11.22)	$t_{(191)} = 1.25$, $P = 0.21$
Female (n = 24, 12.4%)	30.17 (12.84)	
Employment status		
Unemployed (n = 132, 68.4%)	27.47 (11.38)	$t_{(191)} = 0.07$, $P = 0.94$
Employed (n = 61, 31.6%)	27.34 (11.68)	
Education		
Less than high school (n = 64, 33.2%)	29.44 (12.12)	$t_{(191)} = 1.73$, $P = 0.09$
More than high school (n = 129, 66.8%)	26.43 (11.00)	
Ethnic group		
African American (n = 150, 77.7%)	27.23 (11.44)	$F_{(2, 190)} = 0.48$, $P = 0.62$
Hispanic (n = 36, 18.7%)	28.81 (12.11)	
Other (n = 7, 3.6%)	24.71 (7.95)	
Marital group		
Currently married (n = 34, 17.6%)	27.59 (12.41)	$F_{(2,190)} = 0.41$, $P = 0.66$
Never married (n = 126, 65.3%)	27.82 (11.64)	
Widowed/separated/divorced (n = 33, 17.3%)	25.79 (9.72)	

N varies due to missing data.

Table 8
Univariate associations with Posttraumatic Stress Disorder (PTSD) symptoms total at 12 months

	Posttraumatic Stress Diagnostic Scale Mean (SD)	Univariate test of statistical significance
Psychological difficulties prior to injury		
Lifetime social service need		
Yes (n = 146, 80.2%)	28.58 (11.79)	$t(180) = 2.18, \ P < 0.03$[a]
No (n = 36, 19.8%)	23.92 (11.41)	
Lifetime social service use		
Yes (n = 58, 31.7%)	31.00 (11.78)	$t(180) = 2.70, \ P < 0.01$[a]
No (n = 125, 68.3%)	26.10 (11.23)	
Current mental health need		
Yes (n = 69, 37.9%)	30.56 (11.74)	$t(180) = 2.69, \ P < 0.01$[a]
No (n = 113, 62.1%)	25.89 (11.21)	
Lifetime mental health need		
Yes (n = 98, 53.8%)	29.82 (11.80)	$t(180) = 2.76, \ P < 0.01$
No (n = 84, 46.2%)	25.14 (10.90)	
Likely alcohol problem		
Yes (n = 93, 62.8%)	27.85 (11.15)	$t(146) = 0.08, \ P < 0.94$
No (n = 55, 37.2%)	28.0 (11.13)	
Prior traumatic exposure and stressors		
Prior exposure to a trauma		
No (n = 27, 15.0%)	23.48 (7.75)	$t(49.86) = 2.64, \ P < 0.01$[a]
Yes (n = 153, 85.0%)	28.15 (11.74)	
Meet subjective distress Diagnostic criteria for prior trauma		
No (n = 63, 39.4%)	26.16 (11.81)	$t(158) = 1.51, \ P < 0.14$
Yes (n = 97, 60.6%)	29.00 (11.52)	
Likely PTSD from prior event		
No (n = 170, 94.4%)	27.09 (11.16)	$t(178) = 1.75, \ P < 0.08$[a]
Yes (n = 10, 5.6%)	33.50 (13.27)	
Sum of stressful life events in past year		
	14.72 (6.34)	$r(181) = 0.21, \ P < 0.004$[a]

[a] N varies due to missing data.

A simultaneous multiple regression model incorporating these 11 statistically significant predictors using data from the 193 completers was significant, $F(29, 121) = 2.41, \ P < 0.001; \ R^2 = 0.37$. The four variables accounting for statistically significant independent variance in the regression model were 10 days postinjury need for instrument support ($\beta = 0.29, \ P < 0.01$), adequacy of instrument support ($\beta = -0.37, \ P < 0.01$), need for emotional support ($\beta = -0.30, \ P < 0.01$), and need for social services ($\beta = 0.31, \ P < 0.03$). These results suggest that recovery variables in the immediate postinjury phase were the most critical predictors of long-term negative outcomes. Through multiple imputation procedures, we confirmed the importance of perceived adequacy of assistance with instrumental tasks 10 days postinjury predicting chronic PTSD symptoms 1 year later ($P < 0.02$).

Our data suggests that a large proportion of at-risk patients presenting with orofacial injury to our safety-net hospitals have high rates of psychiatric

Table 9
Univariate associations with Posttraumatic Stress Disorder symptoms total at 12 months

	Posttraumatic Stress Diagnostic Scale Mean (SD)	Univariate test of statistical significance
Exposure characteristics		
Cause of injury		
Assaultive (n = 156, 82.1%)	27.47 (11.65)	$t(191) = 0.09$, $P = 0.93$
Accident (n = 37, 17.9%)	27.27 (10.70)	
Pain on admission (0–10)	6.73 (2.78)	$r(193) = 0.05$, $P = 0.53$
Pain at 10 days post (0–10)	3.97 (3.20)	$r(179) = 0.16$, $P = 0.03$
Surgeon-judged injury severity (0–28)	6.01 (2.32)	$r(193) = 0.02$, $P = 0.83$
Overall distress at discharge	13.23 (3.82)	$r(193) = 0.10$, $P = 0.19$
Coping resources post injury		
Current social service need		
Yes (n = 90, 49.5%)	31.22 (12.41)	$t(167.62) = 4.28$, $P < 0.001$[a]
No (n = 92, 50.5%)	24.17 (9.61)	
Current social service use		
Yes (n = 27, 14.8%)	31.48 (11.79)	$t(180) = 1.87$, $P = 0.06$[a]
No (n = 155, 85.2%)	26.99 (11.48)	
How much more instrumental support needed? (rated 10 days postdischarge)		
A lot more (n = 21, 11.7%)		$r(180) = -0.06$, $P = 0.0018$
Some more (n = 30, 16.7%)		
A little more (n = 38, 21.1%)		
No more (n = 91, 50.6%)		
Anyone to count on for instrumental support? (rated 10 days postdischarge)		
No (n = 23, 12.6%)		$r(178) = -0.40$, $P < 0.001$[a]
No need (n = 7, 3.8%)		
Yes (n = 152, 83.5%)		
How much more emotional support needed? (rated 10 days postdischarge)		
A lot more (n = 18, 10.0%)		$r(180) = -0.21$, $P < 0.01$[a]
Some more (n = 32, 17.8%)		
A little more (n = 32, 17.8%)		
No more (n = 98, 54.4%)		
Anyone to count on for emotional support? rated 10 days postdischarge)		
No (n = 15, 8.2%)		$r(178) = -0.34$, $P < 0.001$[a]
No need (n = 4, 2.2%)		
Yes (n = 163, 89.6%)		

[a] $N \neq 193$; N varies due to missing data.

symptomatology for up to a year after the injury. Among other symptoms, anxiety and depression were found at high levels for prolonged periods following traumatic facial injury. Approximately 25% of our sample reported experiencing symptoms consistent with a diagnosis of acute PTSD at 1 month, and 22% at 12 months postinjury. This rate is comparable with that found in motor vehicle accident survivors [18–20], but less than that reported in sexual assault survivors [21], or war veterans years after the war [22]. The sustained high levels of PTSD symptoms reflect ongoing distress that likely interferes with adequate life functioning and social rehabilitation.

Although objective exposure is often regarded to be the sine qua non of PTSD etiology, the severity of traumatic facial injury did not predict higher rates of symptoms in our patients. In part, this null result may have been due to constrained variance in the participant sample. All individuals entered into our study had a particular kind of facial injury within a narrow band of moderate severity. Individuals with mild facial injuries requiring minimal treatment were excluded, as were patients whose injuries were so severe (eg, gunshot wounds) that they could not provide informed consent or required very extensive surgery. Although these limitations may limit the theoretical conclusions to be drawn from our results, they do not limit their applicability to the population of interest; namely, minority victims with orofacial injury.

Social correlates

Beyond the psychological sequelae, an understanding of the social and environmental factors that influence risk behavior, medical compliance, and recovery is central to any efforts to treat at-risk trauma victims and reduce recurrent injury. Previous research has indicated that supportive social relationships can enhance both physical and emotional well-being during the recovery phase [23]. In investigating the perceived availability of support, we determined that the overwhelming majority of the injury patients perceived support to be available to them. Specifically, patients indicated "yes" to the following statements: "I have enough friends and social life" (86%), "I have close contact with members of my family" (88%), and "When things get really bad, I know I can count on my friends and family for help" (90%). Contrary to the emerging image of social alienation among inner-city ethnic minority males, there was no evidence that African American and Hispanic males who were victims of orofacial trauma perceived a general lack of social support. Instead, the cultural norms of family unity and collective responsibility in African American and Hispanic communities may explain why both ethnic groups in our study felt well supported through their recovery. Their positive perceptions of available support suggest that we question any assumptions of social marginality and look closer at avenues of social integration and support available to inner-city minority men at risk for violence-related injuries. Furthermore, the potential positive influence of supportive social relationships on their recovery and well-being should not be underestimated and could be made use of in facilitating targeted interventions.

Support needs and adequacy over the course of the recovery process

To track the support needs and resources of orofacial injury victims over the course of the recovery process, we investigated the need and availability of emotional, financial, and task support (eg, transportation, child care, help with household maintenance) at 10 days and 6 months postsurgery (Table 10).

Table 10
Support needs and adequacy at recall appointments

	10 days (%)	6 months (%)
Emotional support available	87	82
More emotional support needed	46	44
Task support available	81	78
More task support needed	51	44
Financial support available	72	71
More financial support needed	85	80

At 10 days postsurgery, a majority of the patients reported that they had someone to count on for emotional (87%), task (81%), and financial (72%) support. A significant number of patients who had support, however, also indicated that they could have used more emotional (46%), task (51%), and financial (85%) support. Overall, the need for and adequacy of emotional, task, and financial support remained consistent over time; however, the relationship between support needs and recovery appeared to change over time. For example, we found that the adequacy of emotional support early in the recovery process was associated with reduced patient complaints ($P = 0.04$). Six months after surgery, however, adequacy of financial support replaced emotional support as a predictor of patient complaints ($P = 0.04$). This finding suggests that the nature of support needs of at-risk patients treated for orofacial injury change over time, and support resources may need to be tailored to the evolving needs of the patient if we are to favorably influence recovery outcomes.

Correlates of patient compliance

Given the high rates of psychosocial problems in vulnerable patients presenting with orofacial injuries, we were interested in exploring issues of compliance with follow-up care and determining whether postoperative compliance could be predicted from baseline demographic and psychosocial data. Patients unwilling to adhere to postoperative instructions or return for recall visits are believed to be at a heightened risk for poor outcomes. This perception is particularly germane to the use of treatment modalities that rely exclusively on maxillomandibular fixation (MMF) to facilitate fracture healing, and depend principally on the patient's compliance for 4 to 6 weeks. Stone et al [24] have shown a strong association between poor patient compliance and postoperative complications—particularly infections—following operative treatment of mandibular fractures. In their study sample, virtually all the patients who developed postoperative infections subsequent to open reduction with wire osteosynthesis released their MMF prematurely against medical advice.

In our study, we used four indicators of patient compliance. Treating clinicians were asked to provide yes/no responses to the following three

items: MMF broken/removed by patient, patient maintains good oral hygiene, and patient follows instructions. Our fourth measure of patient compliance was missed follow-up appointments. According to clinician reports, most patients followed instructions for postoperative care (87%), maintained good oral hygiene (83%), and did not remove or break their MMF (93%) during the early recovery period. The major compliance problem related to patients failing to show up for their scheduled recall appointments.

Patient attendance was tracked over a 1-year period to determine the number of missed appointments for the four scheduled recall visits. As is often found in longitudinal studies involving vulnerable populations, a substantial proportion of participants were lost to attrition over the year. Only 43% of the patients attended all recall clinic appointments over the 1-year recall period. Compliance appeared to vary over time, with the problem of missed recall appointments increasing as time passed in the recovery process. Although most injured patients (79%) returned for recall visits within a 1-month period after surgery, only 58% returned for the 1-year recall appointment, regardless of their perceived health and all other health indicators. Patients were significantly more to likely to keep to the initial recall visits required for the care of their physical injuries, but were less likely to come back for the long-term recalls required for the psychosocial assessments. Compared with the 10-day postsurgery recall visit, those patients returning for 6-month recall visits required, on average, five additional mail and telephone reminders.

Appointment-keeping behavior did not differ based on age, gender, or marital status. A significantly high nonattendance rate ($P = 0.02$) was seen among patients who reported regular alcohol use at the time of hospital admission. Those patients who completed the study were more likely to be African American, $\chi^2(2) = 6.50$, $P < 0.03$; better educated, $\chi^2(1) = 5.86$, $P < 0.02$; and to have only moderate substance use, $\chi^2(3) = 22.53$, $P < 0.001$. None of the health-related variables (eg, Oral Health Assessment Index, perceived general health) or perceived social support was associated with missed appointments, however. Our findings clearly indicate that the assumption of poor compliance among at-risk patients with facial injuries may not be valid. Our 1-month recall rate of 79% compares favorably with the 46% recall rate reported by Stewart and Chen [25], in a prospective study of 59 facial trauma patients treated at an urban trauma hospital. We hypothesize that the use of patient tracers and the provision of financial incentives to medically indigent patients may mitigate against some of the barriers to care and may promote compliance and appointment-keeping behavior. Compliance during the early phase of physical recovery does not appear to be a problem in our study population. Long-term compliance, however, as may be required for the monitoring and treatment of evolving psychological sequelae, may need personalized recall efforts by specialized clinic staff.

Clinical implications

In light of the extent of acute and chronic symptomatology in indigent, minority individuals presenting with orofacial injury, psychological screening and treatment should be an integral element of injury management. Inasmuch as these individuals tend to be young and otherwise healthy, the facial injury may be their only encounter with the health care system. Hence, the clinician treating the physical injury may also be the most appropriate person to utilize the opportunity to carry out gross, initial screening for adverse psychological sequelae, particularly PTSD. Strategic questions about prior psychological disturbances, levels of pain at the tenth day follow-up appointment, and coping resources in the immediate recovery phase (both emotional and instrumental support, as well as perceived need for social services), may clue the surgeon to developing sequelae. Although some investigators have suggested that PTSD occasionally remits spontaneously, it is clear that for many it is a chronic disorder, resulting in many other psychological and social difficulties [26,27]. Early identification and treatment may help offset the chronic phase of PTSD. Stress debriefing, counseling, and general psychological support are some of the mechanisms for assisting patients through the early phases of recovery. Our results indicate that many of our socioeconomically marginalized patients need help in dealing with the stress of their orofacial injury. Patients reporting a relative lack of coping resources should be considered particularly at risk for the development of negative psychological outcomes. Inquiring about these areas during follow-up visits may be an efficient manner in which to identify at-risk individuals and triage them for more comprehensive assessment and treatment if needed. Intervention implications include case management to ensure continuity and integration of services, and facilitating access to available social services and benefits.

Perhaps the most compelling recommendation we can make is that the surgical team that is treating the physical facial injury in vulnerable patients also pay attention to the less tangible psychological well-being of the patient. Furthermore, health care providers should be sensitized to the potential for acute psychological reactions to cascade into conditions that are more recalcitrant. Contrary to common perception, lack of treatment compliance is not a major issue in indigent individuals with orofacial injury. Poor appointment compliance over extended periods can be a problem, however, and may simply reflect the complexity of their lives and lack of resources, such as having no available means of transportation. Compliance with long-term regimens, particularly when psychological interventions are indicated, can be facilitated through a system of telephone and mail reminders, as well as the provision of patient incentives. In addition to cognitive therapies that focus on the subjective response to the injury, patients would also gain from assistance in securing access to available social services and benefits.

In sum, it is evident that a large proportion of our indigent patients presenting with orofacial injury manifest acute psychological sequelae. Although many patients may recover, in a sizeable proportion the symptoms may persist for extended periods of time and prove to be an obstacle to rehabilitation and reintegration. Health care givers should pay equal attention to evolving psychological sequelae. Strategic questions and screening for risk indicators can help with timely posttrauma identification of individuals who are most vulnerable to the development of chronic symptomatology and PTSD. Only through a multidisciplinary perspective is it possible to develop a comprehensive treatment strategy that combines surgical treatment with psychosocial interventions to address all aspects of the injury and maximize recovery potential in these patients with heightened needs.

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