

EP-075

**지역응급의료센터에 내원한
전동킥보드 및 자전거 탑승자의
두개안면 손상 양상 비교 분석: 단일
기관 후향적 연구**
(Comparative Analysis of Craniofacial Injury Patterns
in Electric Scooter and Bicycle Riders Presenting to a
Local Emergency Medical Center:
A Retrospective Single-Center Study)



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Purpose: The proliferation of electric scooters (e-scooters) has increased e-scooter-related craniofacial trauma. This study compared demographic characteristics, injury circumstances, craniofacial injury patterns, and clinical outcomes between e-scooter and bicycle riders at a local emergency medical center.

Methods: This single-center retrospective study reviewed 365 patients (e-scooter n=57, bicycle n=308) presenting with craniofacial injuries to Nowon Eulji Medical Center between January 2023 and November 2025. Fracture sites, soft tissue injury locations and surgical procedures were coded independently per anatomical site. Welch's t-test and chi-square or Fisher's exact test were applied (p < 0.05).

Results: E-scooter riders were significantly younger (32.2 ± 15.8 vs. 49.0 ± 21.9 years, p < 0.001), more frequently injured at nighttime (45.6% vs. 18.2%, p < 0.001), more often transported by EMS (68.4% vs. 52.6%, p = 0.027), and more alcohol-involved (28.1% vs. 9.1%, p < 0.001). Fracture rates were comparable (15.8% vs. 16.6%, p = 0.886), with orbital fractures most common in both groups. Cheek and chin injuries were more prevalent in e-scooter riders (22.8%; 17.7% vs. 10.0%), while forehead injuries predominated in bicycle riders (20.3%). Concurrent intracranial hemorrhage occurred exclusively in bicycle riders (0% vs. 5.2%, p = 0.078). Surgical rates trended higher in e-scooter riders (52.6% vs. 40.6%, p = 0.091).

Conclusion: E-scooter craniofacial injuries predominantly affect younger adults, occurring more frequently at night with greater alcohol involvement. Despite comparable fracture rates, distinct soft tissue distributions and absence of intracranial hemorrhage in e-scooter riders suggest different injury biomechanics. Mandatory helmet legislation, alcohol enforcement, and nighttime speed restrictions are warranted.

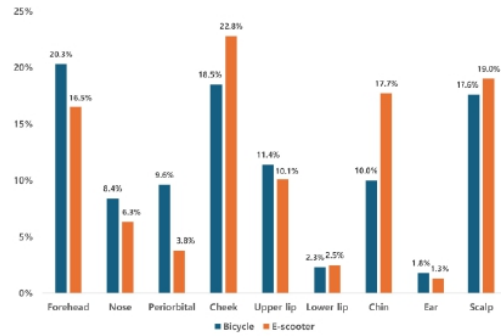


Fig. 1. Anatomical distribution of soft tissue craniofacial injuries in bicycle and e-scooter riders

Table 1. Baseline Characteristics and Circumstances of E-scooter vs Bicycle Injuries

Variables	Total (N=365)	Bicycle (n=308)	E-scooter (n=57)	p-value
Age (years), mean ± SD	46.3 ± 21.5	49.0 ± 21.9	32.2 ± 15.8	<0.001*
Age group, n (%)				<0.001*
16-19 years	53 (14.5)	43 (14.0)	10 (17.5)	
20-29 years	68 (18.6)	43 (14.0)	25 (43.9)	
30-39 years	37 (10.1)	29 (9.4)	8 (14.0)	
40-49 years	34 (9.3)	29 (9.4)	5 (8.8)	
50-59 years	47 (12.9)	42 (13.6)	5 (8.8)	
60-69 years	33 (9.0)	52 (16.9)	1 (1.8)	
70-79 years	55 (15.1)	53 (17.2)	2 (3.5)	
≥80 years	18 (4.9)	17 (5.5)	1 (1.8)	
Sex, n (%)				0.141*
Male	266 (72.9)	229 (74.4)	37 (64.9)	
Female	99 (27.1)	79 (25.6)	20 (35.1)	
Time of day, n (%)				<0.001**
Day (07:00-14:00)	120 (33.0)	105 (34.2)	15 (26.3)	
Evening (14:00-22:00)	162 (44.5)	146 (47.6)	16 (28.1)	
Night (22:00-07:00)	82 (22.5)	56 (18.2)	26 (45.6)	
Season, n (%)				0.549**
Spring (Mar-May)	105 (28.8)	90 (29.2)	15 (26.3)	
Summer (Jun-Aug)	114 (31.2)	92 (29.9)	22 (38.6)	
Autumn (Sep-Nov)	105 (28.9)	92 (29.9)	16 (28.1)	
Winter (Dec-Feb)	38 (10.4)	34 (11.0)	4 (7.0)	
Route of arrival, n (%)				0.027*
EMS (119)	201 (55.1)	162 (52.6)	39 (68.4)	
Self-transport	164 (44.9)	146 (47.4)	18 (31.6)	
Helmet use, n (%)				0.218*
Yes	51 (14.0)	46 (14.9)	5 (8.8)	
No	314 (86.0)	262 (85.1)	52 (91.2)	
Alcohol involvement, n (%)				<0.001**
Yes	44 (12.1)	28 (9.1)	16 (28.1)	
No	321 (87.9)	280 (90.9)	41 (71.9)	
Loss of consciousness, n (%)				0.283*
Yes	65 (17.8)	52 (16.9)	13 (22.8)	
No	300 (82.2)	256 (83.1)	44 (77.2)	

* Student's t-test (Welch's t-test due to unequal variances, Levene's test p<0.05)
** Pearson's chi-square test
* Fisher's exact test

Table 1. Baseline Characteristics and Circumstances of E-scooter vs Bicycle Injuries

Table 2. Clinical Outcomes and Treatment of E-scooter vs Bicycle Injuries

Variable	Total (N=365)	Bicycle (n=308)	E-scooter (n=57)	p-value
Injury type, n (%)				0.886*
without fractures	305 (83.6)	257 (83.4)	48 (84.2)	
with fractures	60 (16.4)	51 (16.6)	9 (15.8)	
Fracture site, n (%)	N=93	N=77	N=16	0.228*
Frontal	5 (5.4)	5 (6.5)	0 (0.0)	
Orbital	27 (29.0)	23 (29.9)	4 (25.0)	
Nose	23 (24.7)	20 (26.0)	3 (18.8)	
Maxilla	18 (19.4)	14 (18.2)	4 (25.0)	
Zygoma	17 (18.3)	14 (18.2)	3 (18.8)	
Mandible	3 (3.2)	1 (1.3)	2 (12.5)	
Surgery performed, n (%)				0.091*
Yes	155 (42.5)	125 (40.6)	30 (52.6)	
No	210 (57.5)	183 (59.4)	27 (47.4)	
Type of surgery, n (%)	N=228	N=193	N=35	0.919**
Primary closure	199 (87.3)	169 (87.6)	30 (85.7)	
CR	12 (5.3)	10 (5.2)	2 (5.7)	
OR/IF	9 (3.9)	7 (3.6)	2 (5.7)	
FTSG	3 (1.3)	3 (1.6)	0 (0.0)	
Gillies'	3 (1.3)	2 (1.0)	1 (2.9)	
Burrhole trephination	1 (0.4)	1 (0.5)	0 (0.0)	
Tertiary closure	1 (0.4)	1 (0.5)	0 (0.0)	
Hospitalization, n (%)				0.400*
Yes	30 (8.2)	24 (7.8)	6 (10.5)	
No	335 (91.8)	284 (92.2)	51 (89.5)	

* Pearson's chi-square test
** Fisher's exact test
(CR, closed reduction; OR/IF, open reduction and internal fixation; FTSG, full-thickness skin graft)

Table 2. Clinical Outcomes and Treatment of E-scooter vs Bicycle Injuries