

Title page

Title: Development and Validation of a Novel Classification System and Prognostic Model for Open Traumatic Brain Injury: A Multicenter Retrospective Study

Yuhui Chen^{1,2#}, Li Chen^{1,2#}, Liang Xian^{1,2}, Haibing Liu^{1,2}, Jiaxing Wang³, Shaohuai Xia⁴, Liangfeng Wei^{1,2}, Xuewei Xia^{4*}, Shousen Wang^{1,2*}

¹Department of Neurosurgery, Fuzong Clinical Medical College of Fujian Medical University, Fuzhou, Fujian, China

²Fujian Provincial Clinical Medical Research Center for Minimally Invasive Diagnosis and Treatment of Neurovascular Diseases, Fuzhou, Fujian, China

³Department of Neurosurgery, The People's Hospital of China Three Gorges University, Yichang, Hubei, China

⁴Department of Neurosurgery, Affiliated Hospital of Guilin Medical University, Guilin, Guangxi, China

[#]Yuhui Chen and Li Chen contributed equally to this work.

^{*}Corresponding authors:

Xuewei Xia, Email: xxw7456@163.com

Shousen Wang, Email: wshsen@126.com

Table S1. Demographic and clinical characteristics of patients with OTBI at three medical centers in the training set.

Characteristics	Center 1	Center 2	Center 3	<i>p</i> Value
Subjects, n (%)	121(44.60)	79(29.20)	71(26.20)	
Median age (IQR) yrs.	44.00(25.00-55.00)	43.00(26.50-56.00)	46.00 (38.50-56.00)	0.116
Gender, male (%)	105(86.78)	73(92.41)	53(80.28)	0.092
Mechanism of injury (%)				0.335
Traffic accident	53(43.80)	33(41.77)	25(35.21)	
Blow injury	21(17.36)	15(18.99)	23(32.39)	
Free fall	21(17.36)	12(15.19)	7(9.86)	
Stumble	23(19.00)	15(18.99)	12(16.90)	
Others	3(2.48)	4(5.06)	4(5.63)	
Median GCS (IQR)	12(8-15)	11(7-14)	13(8-15)	0.288
Pupillary reactions (%)				0.988
Both reacting	73(60.33)	49(62.03)	44(61.25)	
One reacting	31(25.62)	21(26.58)	18(25.83)	
None reacting	17(14.05)	9(11.39)	9(12.92)	
OTBI classification (%)				0.547
A	59(48.76)	44(55.70)	42(59.15)	
B	29(23.97)	15(18.99)	16(22.54)	
C	33(27.27)	20(25.31)	13 (18.31)	
Injuries involving 2 or more calvariae (%)	44(36.36)	22(27.85)	17(23.94)	0.161
Basal skull fracture (%)	64 (52.89)	47(59.49)	41(57.75)	0.621
Brain swelling (%)	25(20.66)	12(15.19)	8(11.27)	0.222
SAH (%)	67(55.37)	35(44.30)	34(47.89)	0.280
CC (%)	57(47.11)	38(48.10)	32(45.07)	0.931
IPH (%)	49(40.50)	33(41.77)	33(46.48)	0.713
SDH (%)	68(56.20)	42(53.16)	30(42.25)	0.167
EDH (%)	71(58.68)	45(56.96)	34(52.11)	0.672

IVH (%)	4(3.31)	2(2.53)	6(8.45)	0.154
Median PLR (IQR)	188.52(106.29- 268.06)	155.97(108.50- 239.06)	194.12(121.04- 281.08)	0.472
Median NLR (IQR)	13.41(8.45-19.25)	12.10(7.86-19.35)	15.26(8.79-19.09)	0.602
Admission glucose (IQR)	7.44(6.02-10.11)	7.89(6.55-9.46)	8.30(6.44-10.30)	0.384
Coagulopathy (%)	28(23.14)	9(11.39)	10(14.08)	0.070
Surgical methods (%)				0.952
Cranioplasty	79(65.29)	54(68.35)	48(67.61)	
Mini-craniotomy	8(6.61)	5(6.33)	6(8.45)	
DC	34(28.10)	20(25.32)	17(23.94)	
Complications (%)	39(32.23)	34(43.04)	23(32.39)	0.243

Legends: GCS, Glasgow Coma Scale; OTBI, open traumatic brain injury; SAH, subarachnoid hemorrhage; CC, cerebral contusion; IPH, intraparenchymal hemorrhage; SDH, subdural hematoma; EDH, epidural hematoma; IVH, intraventricular hemorrhage; PLR, platelets: lymphocyte ratio; NLR, neutrophil: lymphocyte ratio; DC, decompressive craniectomy; IQR, interquartile range.

Table S2. Demographic and clinical characteristics of patients with OTBI in training set and validation set.

Characteristics	Training set (n = 271)	Validation set (n = 110)	<i>p</i> Value
Median age (IQR) yrs.	45.00 (29.00, 55.50)	50.50 (35.75, 57.00)	0.062
Gender, male (%)	235 (86.72)	91 (82.73)	0.315
Mechanism of injury (%)			0.697
Traffic accident	111 (40.96)	44 (40.00)	
Blow injury	59 (21.77)	18 (16.36)	
Free fall	40 (14.76)	21 (19.09)	
Stumble	50 (18.45)	22 (20.00)	
Others	11 (4.06)	5 (4.55)	
Median GCS (IQR)	12.00 (8.00, 15.00)	10.00 (8.00, 13.00)	0.093
Pupillary reactions (%)			0.173
Both reacting	166 (61.25)	57 (51.82)	
One reacting	71 (26.20)	39 (35.45)	
None reacting	34 (12.55)	14 (12.73)	
OTBI classification (%)			0.811
A	145 (53.51)	55 (50.00)	
B	60 (22.14)	27 (24.55)	
C	66 (24.35)	28 (25.45)	
Injuries involving 2 or more calvariae (%)	83 (30.63)	39 (35.45)	0.360
Basal skull fracture (%)	152 (56.09)	69 (62.73)	0.234
Brain swelling (%)	45 (16.61)	23 (20.91)	0.320
SAH (%)	136 (50.18)	47 (42.73)	0.187
CC (%)	127 (46.86)	56 (50.91)	0.474
IPH (%)	115 (42.44)	51 (46.36)	0.483
SDH (%)	140 (51.66)	51 (46.36)	0.349
EDH (%)	153 (56.46)	53 (48.18)	0.142
IVH (%)	12 (4.43)	7 (6.36)	0.432
Median PLR (IQR)	176.30 (107.08, 268.46)	153.26 (111.31, 202.26)	0.072
Median NLR (IQR)	13.78 (8.27, 19.31)	13.40 (10.42, 17.17)	0.486

Admission glucose (IQR)	7.80 (6.27, 9.93)	8.44 (6.99, 9.57)	0.357
Coagulopathy (%)	47 (17.34)	25 (22.73)	0.224
Surgical methods (%)			0.417
Cranioplasty	181 (66.79)	66 (60.00)	
Mini-craniotomy	19 (7.01)	8 (7.27)	
DC	71 (26.20)	36 (32.73)	
Complications (%)	96 (35.42)	44 (40.00)	0.401

Legends: GCS, Glasgow Coma Scale; OTBI, open traumatic brain injury; SAH, subarachnoid hemorrhage; CC, cerebral contusion; IPH, intraparenchymal hemorrhage; SDH, subdural hematoma; EDH, epidural hematoma; IVH, intraventricular hemorrhage; PLR, platelets: lymphocyte ratio; NLR, neutrophil: lymphocyte ratio; DC, decompressive craniectomy; IQR, interquartile range.