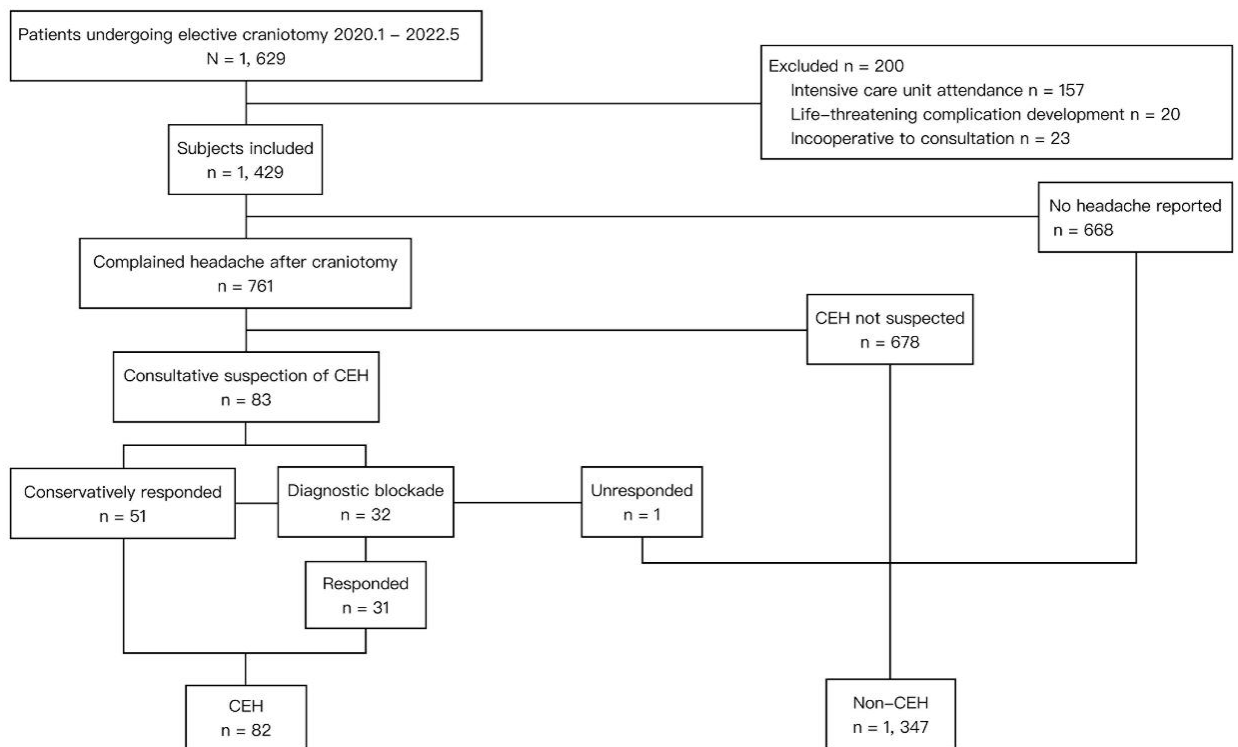




Supplementary Figure 1: Study profile. CEH: Cervicogenic headache.

Supplementary Table 1: Demographic information, sociomedical history, and perioperative data.

Characteristics	CEH <i>n</i> = 82	Non-CEH <i>n</i> = 1347	<i>P</i> -value
Age (years)	47.50 [36.00, 57.00]	50.00 [38.00, 59.00]	0.214
Female (M/F)	41/41 (50.0/50.0)	625/722 (46.4/53.6)	0.569
BMI (kg/m ²)	21.70 [19.72, 23.48]	21.50 [19.80, 23.20]	0.756
Smoking (N/Y)	38/44 (46.3/53.7)	545/802 (40.5/59.5)	0.300
Intemperance (N/Y)	74/8 (90.2/9.8)	1202/145 (89.2/10.8)	1.00
Cervicospinal disorders (N/Y)	23/59 (28.0/72.0)	1084/263 (80.5/19.5)	<0.001 [†]
Chronic headache (N/Y)	74/8 (90.2/9.8)	1182/165 (87.8/12.2)	0.603
Psychiatric disorders (N/Y)	76/6 (92.7/7.3)	1202/145 (89.2/10.8)	0.457
Preexisting systemic morbidities			0.982
Cardiovascular	26 (31.7)	435 (32.3)	
Respiratory	24 (29.3)	373 (27.7)	
Neurological*	6 (7.3)	119 (8.8)	
Others	26 (31.7)	420 (31.2)	
Approach (supra/intra-tentorial)	35/47 (42.7/57.3)	525/822 (39.0/61.0)	0.560
Incision length (cm)	13.00 [9.25, 17.00]	13.00 [9.00, 16.00]	0.540
Operation duration (h)	6.45 [5.43, 7.38]	5.10 [4.60, 5.70]	<0.001 [†]
Positioning (supine/lateral)	38/44 (46.3/53.7)	553/794 (41.1/58.9)	0.357
Anesthesia (TIVA/CIVA)	33/49 (40.2/59.8)	450/897 (33.4/66.6)	0.229

Data were presented with median [IQR] or frequency (%). *Not include craniotomy etiology. [†]*P* < 0.001. BMI: Body mass index; CEH: Cervicogenic headache; CIVA: Combination of intravenous and volatile anesthetics; TIVA: Total intravenous anesthesia.

Supplementary Table 2: CEH pain characteristics (*n* = 82).

Characteristics	Value
CEH onset time (days)	6.0 [5.0–8.0]
Headache characteristics	
Dull	54 (65.9)
Drilling	21 (25.6)
Pounding	22 (26.8)
Indescribable	23 (28.0)
Lancinating	1 (1.2)
Persistent	43 (52.4)
Pain intensity*	
Mild	17 (20.7)
Moderate	55 (67.1)
Severe	10 (12.2)
Laterality	
Unilateral	71 (86.6)
Bilateral	11 (13.4)
Distribution	
Occipital	18 (22.0)
Occipito-temporo-maxillary	15 (18.3)
Supraorbital	26 (31.7)
Mixed	41 (50.0)
Positive diagnostic blockade level	
Atlanto-axial	22 (26.8)
C2–3	48 (58.5)
C3–4	11 (13.4)
Lower joints	1 (1.2)
Provocation	
Neck movement or pressing	68 (82.9)

Changes in position	16 (19.5)
Coughing/sneezing	5 (6.1)
None	11 (13.4)
Comorbid symptoms	
Concurrent neck pain	24 (29.3)
Reduced neck motion	77 (93.9)
Ipsilateral shoulder/arm/ulnar pain	16 (19.5)
Nausea	20 (24.4)
Vomiting	6 (7.3)
Photophobia	11 (13.4)
Phonophobia	5 (6.1)
None	8 (9.8)

Data were presented with median [IQR] or frequency (%). *Pain intensity was evaluated using the 0–10 numerical rating scale (0 for no pain, 10 for the most severe pain, 0–3 for mild pain, 4–7 for moderate pain, and 8–10 for severe pain). CEH: Cervicogenic headache.

Supplementary Table 3: Predictive factors of new-onset CEH after craniotomy.

Factors	Univariate analyses		Multivariate analyses	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
Age (≥50 years)	0.76 (0.52, 1.11)	0.245	—	—
Sex (female)	0.86 (0.59, 1.25)	0.865	—	—
BMI (kg/m ²)				
(15–20)	Reference	—	—	—
(20–25)	0.94 (0.62, 1.47)	0.841	—	—
(25–30)	0.77 (0.33, 1.60)	0.582	—	—
Smoking	0.78 (0.54, 1.14)	0.294	—	—
Alcoholic intemperance	0.89 (0.45, 1.61)	0.774	—	—
Cervicospinal disorders	10.57 (7.01, 16.29)	<0.001	10.84 (7.15, 16.80)	<0.001*
Chronic headache	0.77 (0.39, 1.38)	0.503	—	—
Psychiatric disorders	0.65 (0.29, 1.25)	0.327	—	—
Preexisting systemic morbidities				
Cardiovascular	Reference	—	—	—
Respiratory	1.07 (0.66, 1.74)	0.800	—	—
Neurological*	0.84 (0.36, 1.72)	0.714	—	—
Others system	1.03 (0.64, 1.65)	0.902	—	—
Craniotomy etiology				
Intracranial tumor resection	Reference	—	—	—
Aneurysmal clipping	1.33 (0.88, 1.98)	0.237	—	—
Other causes	0.72 (0.43, 1.41)	0.465	—	—
Infratentorial approach	0.85 (0.58, 1.25)	0.505	—	—
Incision length (cm)				
<10	Reference	—	—	—
10–14	1.05 (0.63, 1.76)	0.869	—	—
14–18	1.06 (0.64, 1.77)	0.843	—	—

>18	1.29 (0.71, 2.31)	0.468	–	–
Operation duration (h)			–	–
<5	Reference	–	Reference	–
≥5	4.95 (2.91, 9.07)	<0.001	5.18 (3.01, 9.60)	<0.001
Lateral positioning	0.80 (0.55, 1.17)	0.346	–	–
Intravenous anesthesia	0.74 (0.50, 1.09)	0.205	–	–
(only)				