

World Journal of *Clinical Cases*

World J Clin Cases 2023 March 6; 11(7): 1434-1668



Contents

Thrice Monthly Volume 11 Number 7 March 6, 2023

OPINION REVIEW

- 1434** Reconstruction surgery in head and neck cancer patients amidst the COVID-19 pandemic: Current practice and lessons for the future
Lizambri D, Giacalone A, Shah PA, Tovani-Palone MR

REVIEW

- 1442** Risk factors and digital interventions for anxiety disorders in college students: Stakeholder perspectives
Liu XQ, Guo YX, Xu Y

MINIREVIEWS

- 1458** Immune-related adverse events induced by programmed death protein-1 inhibitors from the perspective of lymphoma immunotherapy
Hou YZ, Zhang Q, Bai H, Wu T, Chen YJ

ORIGINAL ARTICLE

Clinical and Translational Research

- 1467** Analysis of differentially expressed genes related to cerebral ischaemia in young rats based on the Gene Expression Omnibus database
Xia Y, Liu H, Zhu R

Retrospective Study

- 1477** Deep learning-assisted diagnosis of femoral trochlear dysplasia based on magnetic resonance imaging measurements
Xu SM, Dong D, Li W, Bai T, Zhu MZ, Gu GS
- 1488** Facial basal cell carcinoma: A retrospective study of 67 cases
Khalil AA, Enezei HH, Aldelaimi TN, Al-Ani RM

CASE REPORT

- 1498** Successful multidisciplinary therapy for a patient with liver metastasis from ascending colon adenocarcinoma: A case report and review of literature
Tan XR, Li J, Chen HW, Luo W, Jiang N, Wang ZB, Wang S
- 1506** Accessory renal arteries - a source of hypertension: A case report
Calinoiu A, Guluta EC, Rusu A, Minca A, Minca D, Tomescu L, Gheorghita V, Minca DG, Negreanu L
- 1513** Synchronous multiple primary malignant neoplasms in breast, kidney, and bilateral thyroid: A case report
Jia MM, Yang B, Ding C, Yao YR, Guo J, Yang HB

- 1521** Invasive breast carcinoma with osteoclast-like stromal giant cells: A case report
Wang YJ, Huang CP, Hong ZJ, Liao GS, Yu JC
- 1528** Retroperitoneal and abdominal bleeding in anticoagulated COVID-19 hospitalized patients: Case series and brief literature review
Evrev D, Sekulovski M, Gulinac M, Dobrev H, Velikova T, Hadjidekov G
- 1549** Hyperthyroidism and severe bradycardia: Report of three cases and review of the literature
He YL, Xu WX, Fang TY, Zeng M
- 1560** Isolated cerebral mucormycosis that looks like stroke and brain abscess: A case report and review of the literature
Chen CH, Chen JN, Du HG, Guo DL
- 1569** Gastric ectopic pancreas combined with synchronous multiple early gastric cancer: A rare case report
Zhao ZY, Lai YX, Xu P
- 1576** Manifestation of the malignant progression of glioma following initial intracerebral hemorrhage: A case report
Xu EX, Lu SY, Chen B, Ma XD, Sun EY
- 1586** Four kinds of antibody positive paraneoplastic limbic encephalitis: A rare case report
Huang P, Xu M
- 1593** Spontaneous fracture of a titanium mesh cranioplasty implant in a child: A case report
Zhang R, Gao Z, Zhu YJ, Wang XF, Wang G, He JP
- 1600** Rheumatic valvular heart disease treated with traditional Chinese medicine: A case report
Chen WH, Tan Y, Wang YL, Wang X, Liu ZH
- 1607** Mucosa-associated lymphoid tissue lymphoma of the trachea treated with radiotherapy: A case report
Zhen CJ, Zhang P, Bai WW, Song YZ, Liang JL, Qiao XY, Zhou ZG
- 1615** Bow-and-arrow sign on point-of-care ultrasound for diagnosis of pacemaker lead-induced heart perforation: A case report and literature review
Chen N, Miao GX, Peng LQ, Li YH, Gu J, He Y, Chen T, Fu XY, Xing ZX
- 1627** Prostate lymphoma with renal obstruction; reflections on diagnosis and treatment: Two case reports
Chen TF, Lin WL, Liu WY, Gu CM
- 1634** Pulmonary nocardiosis with bloodstream infection diagnosed by metagenomic next-generation sequencing in a kidney transplant recipient: A case report
Deng ZF, Tang YJ, Yan CY, Qin ZQ, Yu N, Zhong XB
- 1642** Primary yolk sac tumor in the abdominal wall in a 20-year-old woman: A case report
Wang Y, Yang J

- 1650** Misdiagnosis of food-borne foreign bodies outside of the digestive tract on magnetic resonance imaging: Two case reports

Ji D, Lu JD, Zhang ZG, Mao XP

- 1656** IgG4-related kidney disease complicated with retroperitoneal fibrosis: A case report

He PH, Liu LC, Zhou XF, Xu JJ, Hong WH, Wang LC, Liu SJ, Zeng JH

LETTER TO THE EDITOR

- 1666** Commentary on a case report and literature review of acute carotid stent thrombosis

Willman M, Lucke-Wold B

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Baharudin Ibrahim, BPharm, PhD, Associate Professor, Pharmacist, Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, Universiti Malaya, Kuala Lumpur 50603, Malaysia. baharudin.ibrahim@um.edu.my

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The WJCC is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Journal Citation Reports/Science Edition, Current Contents®/Clinical Medicine, PubMed, PubMed Central, Scopus, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2022 Edition of Journal Citation Reports® cites the 2021 impact factor (IF) for WJCC as 1.534; IF without journal self cites: 1.491; 5-year IF: 1.599; Journal Citation Indicator: 0.28; Ranking: 135 among 172 journals in medicine, general and internal; and Quartile category: Q4. The WJCC's CiteScore for 2021 is 1.2 and Scopus CiteScore rank 2021: General Medicine is 443/826.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Si Zhao; Production Department Director: Xiang Li; Editorial Office Director: Jin-Lei Wang.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

March 6, 2023

COPYRIGHT

© 2023 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Spontaneous fracture of a titanium mesh cranioplasty implant in a child: A case report

Rui Zhang, Zhe Gao, Yong-Jie Zhu, Xin-Fa Wang, Gang Wang, Jun-Ping He

Specialty type: Surgery

Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): A

Grade B (Very good): 0

Grade C (Good): C

Grade D (Fair): 0

Grade E (Poor): E

P-Reviewer: Alkhatib AJ, Jordan; Hakimi T, Afghanistan; Kung WM, Taiwan

Received: November 17, 2022

Peer-review started: November 17, 2022

First decision: January 3, 2023

Revised: January 15, 2023

Accepted: February 13, 2023

Article in press: February 13, 2023

Published online: March 6, 2023



Rui Zhang, Zhe Gao, Yong-Jie Zhu, Xin-Fa Wang, Gang Wang, Jun-Ping He, Department of Neurosurgery, Nanjing Children's Hospital, Nanjing Medical University, Nanjing 21000, Jiangsu Province, China

Corresponding author: Jun-Ping He, MD, PhD, Chief Doctor, Department of Neurosurgery, Nanjing Children's Hospital, Nanjing Medical University, No. 8 Jiangzhongnan Road, Nanjing 21000, Jiangsu Province, China. hejunping359@163.com

Abstract

BACKGROUND

Titanium mesh cranioplasty is often performed after decompressive craniectomy. Spontaneous fracture of the titanium prosthesis is an extremely rare postoperative complication. Here, we report a 10-year-old boy who presented with a spontaneous fracture of titanium mesh without antecedent head trauma.

CASE SUMMARY

A 10-year-old boy presented with a 1-wk history of a tender bulge over the left temporo-parieto-occipital scalp. He had undergone a temporo-parieto-occipital titanium mesh cranioplasty 26 mo previously. He denied antecedent head trauma. Computerized tomography disclosed a perpendicular fissure in the titanium mesh, suggesting a diagnosis of spontaneous titanium mesh fracture. He underwent a second temporo-parieto-occipital cranioplasty and made an uneventful recovery. Three-dimensional modeling and finite element analyses were used to explore potential risk factors of titanium mesh fracture.

CONCLUSION

We report a case of spontaneous fracture of a titanium mesh cranioplasty implant. The current case and literature review indicate that titanium mesh implants should be well-anchored to the base of bony defects to prevent fatigue-induced fractures.

Key Words: Cranioplasty; Prosthesis fracture; Spontaneous fracture; Titanium; Case report

©The Author(s) 2023. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: Titanium mesh cranioplasty is often indicated after decompressive craniectomy. We present a rare case of a spontaneous fracture of a titanium mesh cranioplasty implant in a 10-year-old boy. By conducting a literature review and finite element analysis, we learned that titanium mesh prosthetic implants should be well-anchored to the base of bony defects to prevent fatigue-induced fractures.

Citation: Zhang R, Gao Z, Zhu YJ, Wang XF, Wang G, He JP. Spontaneous fracture of a titanium mesh cranioplasty implant in a child: A case report. *World J Clin Cases* 2023; 11(7): 1593-1599

URL: <https://www.wjgnet.com/2307-8960/full/v11/i7/1593.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v11.i7.1593>

INTRODUCTION

Titanium mesh is considered safe for implantation during cranioplasties in both adults and children[1-5], and is among the most commonly used biocompatible materials for calvarial fixation and reconstruction. Although titanium mesh cranioplasty is usually a straightforward surgical procedure, complication rates may reach 34%[6-10]. However, spontaneous fractures of titanium mesh cranioplasty implants are extremely rare. To our knowledge, only one case has been reported previously[11]. Here, we report a spontaneous fracture of titanium mesh without antecedent head trauma in a 10-year-old boy, and provide a literature review to investigate underlying mechanisms and risk factors.

CASE PRESENTATION

Chief complaints

A 10-year-old boy was admitted to our department with complaint of a tender bulge of the left temporo-parieto-occipital scalp of 1 wk duration.

History of present illness

The patient had undergone a temporo-parieto-occipital cranioplasty 26 mo previously. The patient denied antecedent trauma or intensive force to the head.

History of past illness

Three years previously, the patient fell from a height of 3 meters and sustained a closed head injury. He was brought immediately to an emergency department, where he was diagnosed with a left temporo-parieto-occipital laceration, skull fracture, epidural hematoma, and cerebral contusion. He underwent an emergent craniotomy to evacuate the epidural hematoma, followed by a large decompressive craniectomy of the temporo-parieto-occipital skull flap. He made marked clinical improvement and was readmitted to our department 12 mo later for cranioplasty. Computerized tomography (CT) showed a 10 cm × 8 cm bone defect of the left temporo-parieto-occipital skull with a local encephalocele (Figure 1A and B).

Personal and family history

The patient denied any significant personal or family medical histories.

Physical examination

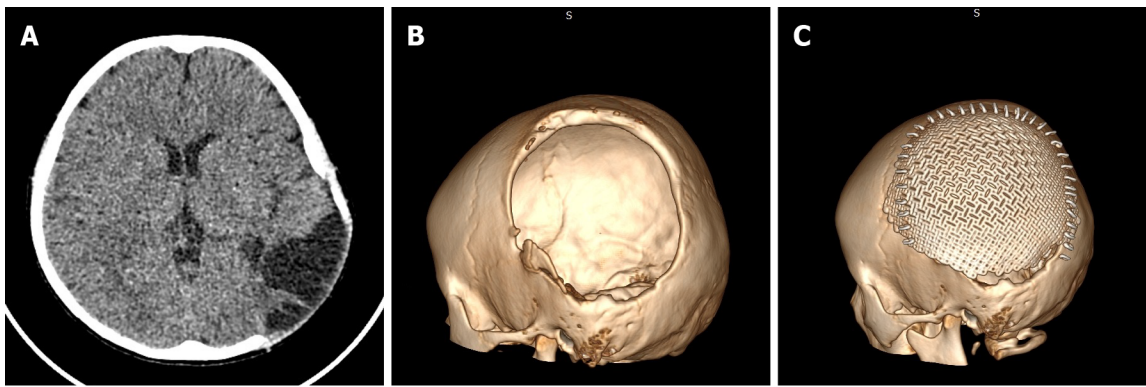
Physical examination disclosed a prominent 4 cm × 5 cm tender malformation of the temporo-parieto-occipital scalp.

Laboratory examinations

Results of routine blood and urine analyses were within normal limits.

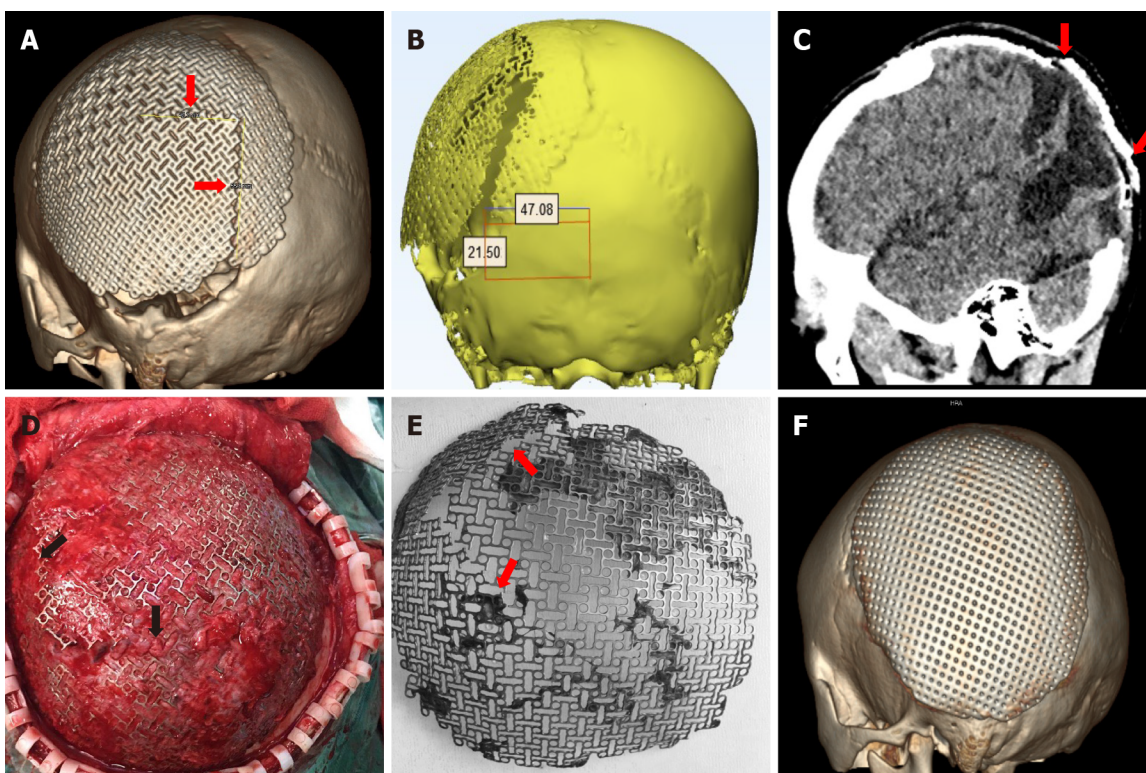
Imaging examinations

Three-dimensional (3-D) CT reconstruction displayed a clear edge of a titanium mesh fracture, which appeared as a reverse “L”-shaped fissure (Figure 2A-C) that originated from a point 2.21 cm superior to the external occipital protuberance and 4.51 cm left of the midline and extended 5.5 cm superiorly to the parietal bone and then turned anteriorly at a perpendicular angle (Figure 2A and B).



DOI: 10.12998/wjcc.v11.i7.1593 Copyright ©The Author(s) 2023.

Figure 1 Computerized tomography images before and after first cranioplasty. A: Axial computerized tomography (CT) image displayed the left temporo-parieto-occipital skull with local encephalocele; B: Three-dimensional (3-D) CT reconstruction revealing a 10 cm × 8 cm defect of the left temporo-parieto-occipital skull; C: 3-D CT reconstruction after first cranioplasty displaying an intact and ideally positioned prosthesis.



DOI: 10.12998/wjcc.v11.i7.1593 Copyright ©The Author(s) 2023.

Figure 2 Images before, during, and after second cranioplasty. A: Three-dimensional (3-D) computerized tomography (CT) reconstruction before the second cranioplasty displayed a reverse "L"-shaped fracture of the titanium mesh prosthesis; B and C: CT at the coronal and sagittal plane revealed the prosthetic fissure (red arrow); D: Intraoperative photograph showing the clear edge of the titanium mesh fracture; E: The fractured titanium mesh was removed during the second cranioplasty; F: 3-D CT reconstruction after the second cranioplasty disclosed an intact and ideally positioned implant.

FINAL DIAGNOSIS

The patient's history, physical findings, laboratory examinations, and CT images were diagnostic of spontaneous fracture of the titanium mesh.

TREATMENT

A temporo-parieto-occipital cranioplasty was performed using a 0.8 mm titanium mesh. Temporal-occipital muscles were stripped from the dura, and the prosthesis was anchored to the base of the bony defect with titanium screws (Figure 2D and F). The temporal-occipital muscles were then fixed to the

prosthesis with nylon suture.

OUTCOME AND FOLLOW-UP

The patient was discharged in stable and asymptomatic condition on the 4th postoperative day.

DISCUSSION

Fractures of orthopedic titanium implants are not rare, especially among devices positioned in the spine and long bones, which are often subjected to weight loading[12-15]. Predisposing factors include: (1) Defective prosthetic material[16]; (2) Poor prosthetic design[17]; (3) Inadequate fixation[18]; (4) Deficient surgical technique[19]; (5) Skull growth; and (6) Biomechanical overload[11]. The titanium mesh used for our patient's first cranioplasty was patient-matched through computer-assisted design and manufacturing, and its quality was assured. Moreover, the patient did not suffer head trauma and the prosthesis was not subjected to weight loading. Therefore, the risks of defective material, poor design, and weight overloading were eliminated. Regarding fixation and surgical technique, the first titanium mesh was implanted by experienced neurosurgeons using a matched titanium screw fixator system. Thus, these two factors were also excluded, leaving the possibilities of pediatric growing fracture and biomechanical overload.

Growing skull fracture, a rare complication of pediatric head trauma, develops after linear fractures with underlying dural tears, and may cause brain herniation[20]. Our patient's dura was intact during the second reconstructive procedure. Hence, this possibility was also excluded. Therefore, the only remaining possibility was biomechanical overload. Jiang *et al*[11] reported a similar case in which head-pillow contact during sleep subjected the prosthesis to biomechanical overload. To explore whether head-pillow contact contributed to our patient's titanium mesh fracture, we performed a simple experiment using a skull model. We created a similar bony defect using a 3-D printed skull model and a plastic mesh to simulate the prosthesis (Figure 3). We fixed the plastic mesh to the model skull and rotated the model on a horizontal plate to simulate head rotation on a pillow (Figure 3A). Because the mesh was not anchored to the base of the bony defect, a remarkable stress line, originating from a point which was 2 cm superior to the protuberantia occipitalis externa and 4 cm left of the midline appeared as soon as the base of the mesh touched the plate (Figure 3B). The shearing force generated along the stress line may lead to fatigue, which could cause a linear fracture. However, this could not explain the reverse "L" rather than a linear configuration of our patient's fracture. We hypothesized that the stress line might change after dilaceration of a linear fracture. We incised the model mesh along the stress line and again rotated the model on a horizontal plate. This resulted in the emergence of a new perpendicular stress line on the mesh (Figure 3C). To further confirm our hypothesis, we invited Minggong Simulation Technology Co., Ltd to evaluate deformation and stress distributions using finite element analysis. We created a head-pillow contact scenario using a skull-implant assembly model and set the loading force at 50 N (gravitational force of the patient's head). As seen in Figure 4, finite element analysis showed a maximum stress of 42 MPa under a 50 N load on the head-pillow contact surface, which indicated that the skull-implant structure could bear the weight of the head under normal circumstances (Figure 4C). However, fatigue behavior analysis revealed that the titanium mesh might not tolerate cyclical loading (Figure 4D), implying that our patient's spontaneous titanium mesh fracture may have resulted from fatigue failure. Therefore, we selected a thickened titanium mesh and anchored it to the base of the bony defect during the second cranioplasty. Follow-up showed excellent results.

CONCLUSION

We report a case of spontaneous fracture of a titanium mesh cranioplasty implant. The current case and literature review indicate that titanium mesh prosthetics should be well-anchored to the base of bony defects to prevent fatigue-induced fractures.

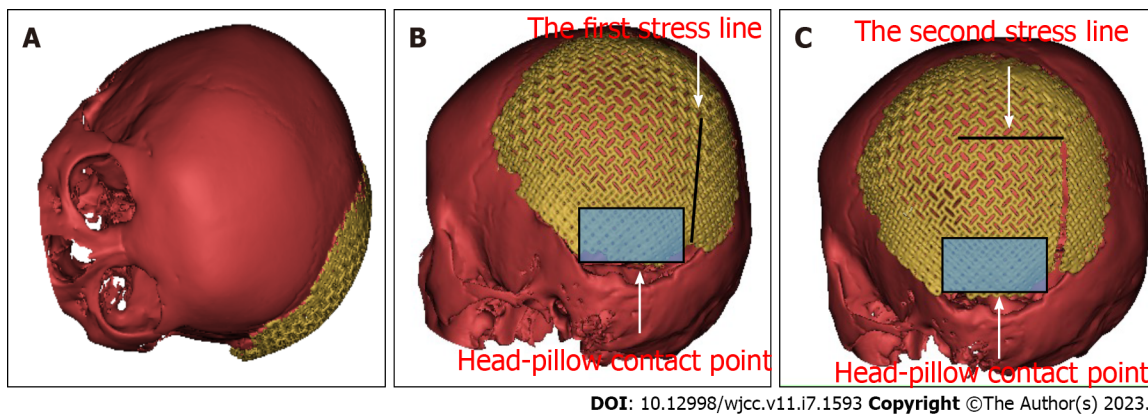


Figure 3 Three-dimensional model of skull-implant. A: Three-dimensional (3-D) printed skull model rotated on a horizontal plate simulated head rotation on a pillow; B and C: Force analysis model of head rotation on a pillow.

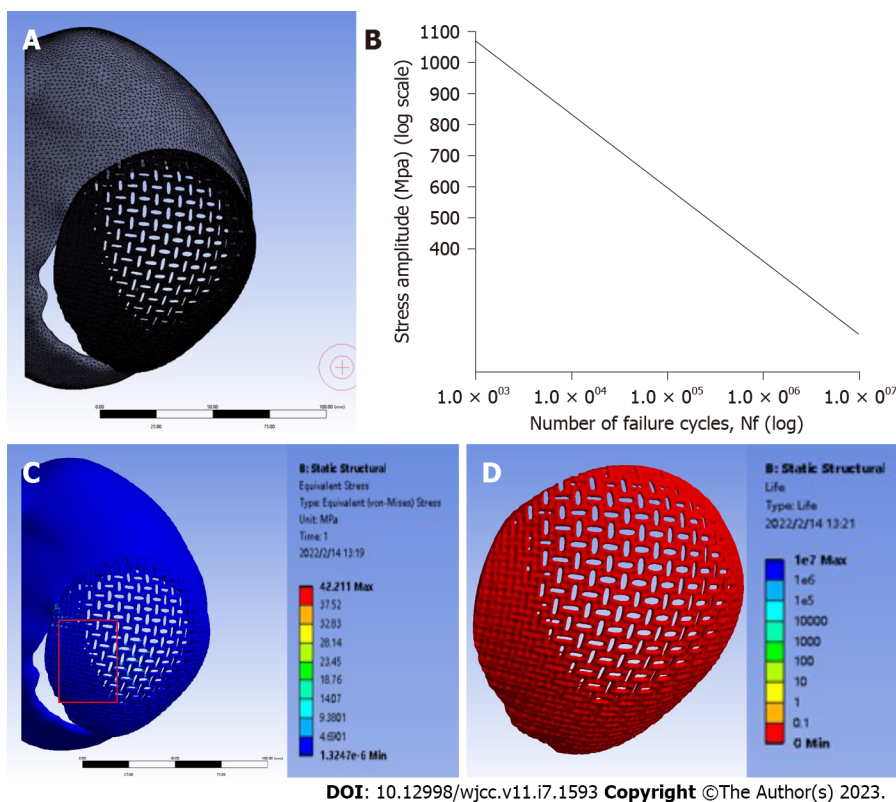


Figure 4 Finite element analysis model. A: Model of skull-implanted mesh; B: Stress life fatigue curve of the skull-implant model; C: Stress distribution analysis of the skull-implant model in contact with a pillow; D: Fatigue behavior analysis of the titanium mesh.

FOOTNOTES

Author contributions: He JP and Wang G contributed to the conception and design; Gao Z, Zhu YJ and Wang XF contributed to the acquisition of data; Zhang R drafted the article; All authors critically revised the article and reviewed submitted version of manuscript; He JP approved the final version of the manuscript on behalf of all authors.

Supported by the National Natural Science Foundation of China, No. 81602212; Natural Science Foundation of Jiangsu Province, No. BK20161119; Key Project supported by Medical Science and Technique Development Foundation No. YKK15139; and Nanjing Medical Science and Technique Development Foundation No. QRX17167.

Informed consent statement: Written informed consent was obtained from the patient's parents for publication of this report and any accompanying images.

Conflict-of-interest statement: The authors declare that they have no conflict of interest to disclose.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: China

ORCID number: Jun-Ping He 0000-0001-9809-6546.

S-Editor: Zhang H

L-Editor: Filipodia

P-Editor: Zhang H

REFERENCES

- 1 **Binhammer A**, Jakubowski J, Antonyshyn O, Binhammer P. Comparative Cost-Effectiveness of Cranioplasty Implants. *Plast Surg (Oakv)* 2020; **28**: 29-39 [PMID: 32110643 DOI: 10.1177/2292550319880922]
- 2 **Hitoshi Y**, Yamashiro S, Yoshida A, Mukasa A. Cranial Reconstruction with Titanium Mesh for Open Depressed Skull Fracture in Children: Reports of Two Cases with Long-term Observation. *Kurume Med J* 2020; **66**: 77-80 [PMID: 32378531 DOI: 10.2739/kurumemedj.MS661011]
- 3 **Sheng HS**, Shen F, Zhang N, Lin FC, Li DD, Cai M, Jiang GQ, Lin J. Titanium mesh cranioplasty in pediatric patients after decompressive craniectomy: Appropriate timing for pre-schoolers and early school age children. *J Craniomaxillofac Surg* 2019; **47**: 1096-1103 [PMID: 31088762 DOI: 10.1016/j.jcms.2019.04.009]
- 4 **Ma IT**, Symon MR, Bristol RE, Beals SP, Joganic EF, Adelson PD, Shafron DH, Singh DJ. Outcomes of Titanium Mesh Cranioplasty in Pediatric Patients. *J Craniofac Surg* 2018; **29**: 99-104 [PMID: 29049146 DOI: 10.1097/SCS.00000000000004045]
- 5 **Goldstein JA**, Paliga JT, Bartlett SP. Cranioplasty: indications and advances. *Curr Opin Otolaryngol Head Neck Surg* 2013; **21**: 400-409 [PMID: 23770828 DOI: 10.1097/MOO.0b013e328363003e]
- 6 **Maqbool T**, Binhammer A, Binhammer P, Antonyshyn OM. Risk Factors for Titanium Mesh Implant Exposure Following Cranioplasty. *J Craniofac Surg* 2018; **29**: 1181-1186 [PMID: 29533254 DOI: 10.1097/SCS.00000000000004479]
- 7 **Mukherjee S**, Thakur B, Haq I, Hettige S, Martin AJ. Complications of titanium cranioplasty--a retrospective analysis of 174 patients. *Acta Neurochir (Wien)* 2014; **156**: 989-998; discussion 998 [PMID: 24615066 DOI: 10.1007/s00701-014-2024-x]
- 8 **Williams LR**, Fan KF, Bentley RP. Custom-made titanium cranioplasty: early and late complications of 151 cranioplasties and review of the literature. *Int J Oral Maxillofac Surg* 2015; **44**: 599-608 [PMID: 25482456 DOI: 10.1016/j.ijom.2014.09.006]
- 9 **Yeap MC**, Tu PH, Liu ZH, Hsieh PC, Liu YT, Lee CY, Lai HY, Chen CT, Huang YC, Wei KC, Wu CT, Chen CC. Long-Term Complications of Cranioplasty Using Stored Autologous Bone Graft, Three-Dimensional Polymethyl Methacrylate, or Titanium Mesh After Decompressive Craniectomy: A Single-Center Experience After 596 Procedures. *World Neurosurg* 2019; **128**: e841-e850 [PMID: 31082551 DOI: 10.1016/j.wneu.2019.05.005]
- 10 **Yoshioka N**, Tominaga S. Titanium Mesh Implant Exposure Due To Pressure Gradient Fluctuation. *World Neurosurg* 2018; **119**: e734-e739 [PMID: 30092473 DOI: 10.1016/j.wneu.2018.07.255]
- 11 **Jiang Y**, Wang YK, Yu MK. Spontaneous fracture of cranioplastic titanium implants without head trauma in an adult: A case report. *Int J Surg Case Rep* 2016; **24**: 50-53 [PMID: 27180320 DOI: 10.1016/j.ijscr.2016.04.039]
- 12 **Kaplan T**, Gulbahar G, Gundogdu AG, Han S. An unexpected complication of titanium rib clips. *Ann Thorac Surg* 2014; **98**: 2206-2209 [PMID: 25468091 DOI: 10.1016/j.athoracsur.2014.02.054]
- 13 **Klezel Z**, Bagley CA, Bookland MJ, Wolinsky JP, Rezek Z, Gokaslan ZL. Harms titanium mesh cage fracture. *Eur Spine J* 2007; **16** Suppl 3: 306-310 [PMID: 17497187 DOI: 10.1007/s00586-007-0377-z]
- 14 **Park SW**, Kim H, In Y. Fracture of titanium nitride-coated femoral component after total knee arthroplasty. *Knee* 2014; **21**: 871-874 [PMID: 24794797 DOI: 10.1016/j.knee.2014.04.002]
- 15 **Yukata K**, Doi K, Hattori Y, Sakamoto S. Early breakage of a titanium volar locking plate for fixation of a distal radius fracture: case report. *J Hand Surg Am* 2009; **34**: 907-909 [PMID: 19410996 DOI: 10.1016/j.jhsa.2009.01.004]
- 16 **Yeganeh A**, Otoukesh B, Kaghazian P, Yeganeh N, Boddohi B, Moghtadaei M. Evaluation of the Etiologies of Implant Fracture in Patients With Fractures of the Implants of Lower Limbs' Long Bones. *Med Arch* 2015; **69**: 405-408 [PMID: 26843735 DOI: 10.5455/medarch.2015.69.405-408]
- 17 **Osman RB**, Ma S, Duncan W, De Silva RK, Siddiqi A, Swain MV. Fractured zirconia implants and related implant designs: scanning electron microscopy analysis. *Clin Oral Implants Res* 2013; **24**: 592-597 [PMID: 22276596 DOI: 10.1111/j.1600-0501.2011.02411.x]
- 18 **Shinohara K**, Takigawa T, Tanaka M, Sugimoto Y, Arataki S, Yamane K, Watanabe N, Ozaki T, Sarai T. Implant Failure of Titanium Versus Cobalt-Chromium Growing Rods in Early-onset Scoliosis. *Spine (Phila Pa 1976)* 2016; **41**: 502-507 [PMID: 26966974 DOI: 10.1097/BRS.0000000000001267]

- 19 **Nematian H**, Clarke A, Hedayat E, Vahdati Z, Milan N, Mehrpour SR, Nabian MH, Mazda K. Complications of single growing rod constructs in the treatment of severe early-onset scoliosis: a lesson relearned. *Spine Deform* 2022; **10**: 1481-1490 [PMID: 35881332 DOI: 10.1007/s43390-022-00554-0]
- 20 **Bir SC**, Kalakoti P, Notarianni C, Nanda A. John Howship (1781-1841) and growing skull fracture: historical perspective. *J Neurosurg Pediatr* 2015; **16**: 472-476 [PMID: 26186359 DOI: 10.3171/2014.12.PEDS14484]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

