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## Contents

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## EDITORIAL

- 7292 Radiation oncology practice during COVID-19 pandemic in developing countries

*Abuhijla F, Abuhijlih R, Mohamad I*

## OPINION REVIEW

- 7297 Complete mesocolic excision and central vascular ligation in colorectal cancer in the era of minimally invasive surgery

*Franceschilli M, Di Carlo S, Vinci D, Sensi B, Siragusa L, Bellato V, Caronna R, Rossi P, Cavallaro G, Guida A, Sibio S*

- 7306 Fecal diversion in complex anal fistulas: Is there a way to avoid it?

*Garg P, Yagnik VD, Dawka S*

## MINIREVIEWS

- 7311 Regulatory roles of extracellular vesicles in immune responses against *Mycobacterium tuberculosis* infection

*Yan Z, Wang H, Mu L, Hu ZD, Zheng WQ*

- 7319 Aortic stenosis and Heyde's syndrome: A comprehensive review

*Lourdusamy D, Mupparaju VK, Sharif NF, Ibebuogu UN*

## ORIGINAL ARTICLE

## Retrospective Study

- 7330 Key determinants of misdiagnosis of tracheobronchial tuberculosis among senile patients in contemporary clinical practice: A retrospective analysis

*Tang F, Lin LJ, Guo SL, Ye W, Zha XK, Cheng Y, Wu YF, Wang YM, Lyu XM, Fan XY, Lyu LP*

- 7340 Long-term outcome of pancreatic function following oncological surgery in children: Institutional experience and review of the literature

*Bolasco G, Capriati T, Grimaldi C, Monti L, De Pasquale MD, Patera IP, Spada M, Maggiore G, Diamanti A*

- 7350 Efficacy of arbidol in COVID-19 patients: A retrospective study

*Wei S, Xu S, Pan YH*

- 7358 Characteristic analysis of clinical coronary heart disease and coronary artery disease concerning young and middle-aged male patients

*Peng KG, Yu HL*

- 7365 Quantitative analysis of early diabetic retinopathy based on optical coherence tomography angiography biological image

*Shi Y, Lin PY, Ruan YM, Lin CF, Hua SS, Li B*

- 7372** Mucin 1 and interleukin-11 protein expression and inflammatory reactions in the intestinal mucosa of necrotizing enterocolitis children after surgery

*Pan HX, Zhang CS, Lin CH, Chen MM, Zhang XZ, Yu N*

#### Observational Study

- 7381** Research on the prognosis of different types of microvessels in bladder transitional cell carcinoma

*Wang HB, Qin Y, Yang JY*

- 7391** Is burnout a mediating factor between sharps injury and work-related factors or musculoskeletal pain?

*Chen YH, Tsai CF, Yeh CJ, Jong GP*

- 7405** Role of international normalized ratio in nonpulmonary sepsis screening: An observational study

*Zhang J, Du HM, Cheng MX, He FM, Niu BL*

#### Randomized Controlled Trial

- 7417** Clinical effectiveness of adding probiotics to a low FODMAP diet: Randomized double-blind placebo-controlled study

*Turan B, Bengi G, Cehreli R, Akpınar H, Soytürk M*

#### SYSTEMATIC REVIEWS

- 7433** Association between COVID-19 and anxiety during social isolation: A systematic review

*Santos ERRD, Silva de Paula JL, Tardieux FM, Costa-e-Silva VN, Lal A, Leite AFB*

#### CASE REPORT

- 7445** Avascular necrosis of the first metatarsal head in a young female adult: A case report and review of literature

*Siu RWH, Liu JHP, Man GCW, Ong MTY, Yung PSH*

- 7453** Successful treatment of solitary bladder plasmacytoma: A case report

*Cao JD, Lin PH, Cai DF, Liang JH*

- 7459** Pseudomyxoma peritonei originating from intestinal duplication: A case report and review of the literature

*Han XD, Zhou N, Lu YY, Xu HB, Guo J, Liang L*

- 7468** Agranulocytosis following injection of inactivated Japanese encephalitis vaccine (Vero cell): A case report

*Wang L, Zhang X, Liu YT*

- 7472** Importance of clinical suspicion and multidisciplinary management for early diagnosis of a cardiac laminopathy patient: A case report

*Santobuono VE, Guaricci AI, Carulli E, Bozza N, Pepe M, Ranauro A, Ranieri C, Carella MC, Loizzi F, Resta N, Favale S, Forleo C*

- 7478** First case of forearm crisscross injury in children: A case report

*Jiang YK, Wang YB, Peng CG, Qu J, Wu DK*

- 7484** Octreotide-induced acute life-threatening gallstones after vicarious contrast medium excretion: A case report  
*Han ZH, He ZM, Chen WH, Wang CY, Wang Q*
- 7490** Acute deep venous thrombosis induced by May-Thurner syndrome after spondylolisthesis surgery: A case report and review of literature  
*Yue L, Fu HY, Sun HL*
- 7498** Successful treatment of refractory lung adenocarcinoma harboring a germline *BRCA2* mutation with olaparib: A case report  
*Zhang L, Wang J, Cui LZ, Wang K, Yuan MM, Chen RR, Zhang LJ*
- 7504** Effective treatment of polyneuropathy, organomegaly, endocrinopathy, M-protein, and skin changes syndrome with congestive heart failure: A case report  
*Fu LY, Zhang HB*
- 7512** Awake craniotomy for auditory brainstem implant in patients with neurofibromatosis type 2: Four case reports  
*Wang DX, Wang S, Jian MY, Han RQ*
- 7520** Coexistence of tuberculosis and squamous cell carcinoma in the right main bronchus: A case report  
*Jiang H, Li YQ*
- 7527** Is simultaneous presence of IgG4-positive plasma cells and giant-cell hepatitis a coincidence in autoimmune hepatitis? A case report  
*Tan YW, Wang JM, Chen L*
- 7535** Surgical treatment of delayed cervical infection and incomplete quadriplegia with fish-bone ingestion: A case report  
*Li SY, Miao Y, Cheng L, Wang YF, Li ZQ, Liu YB, Zou TM, Shen J*
- 7542** Neonatal biliary atresia combined with preduodenal portal vein: A case report  
*Xiang XL, Cai P, Zhao JG, Zhao HW, Jiang YL, Zhu ML, Wang Q, Zhang RY, Zhu ZW, Chen JL, Gu ZC, Zhu J*
- 7551** Hemorrhagic transformation after acute ischemic stroke caused by polycythemia vera: Report of two case  
*Cao YY, Cao J, Bi ZJ, Xu SB, Liu CC*
- 7558** Treatment of lower part of glenoid fractures through a novel axillary approach: A case report  
*Jia X, Zhou FL, Zhu YH, Jin DJ, Liu WX, Yang ZC, Liu RP*
- 7564** Trigger finger at the wrist caused by an intramuscular lipoma within the carpal tunnel: A case report  
*Huang C, Jin HJ, Song DB, Zhu Z, Tian H, Li ZH, Qu WR, Li R*
- 7572** Thrombolysis and embolectomy in treatment of acute stroke as a bridge to open-heart resection of giant cardiac myxoma: A case report  
*Chang WS, Li N, Liu H, Yin JJ, Zhang HQ*
- 7579** Breast adenoid cystic carcinoma arising in microglandular adenosis: A case report and review of literature  
*An JK, Woo JJ, Kim EK, Kwak HY*

- 7588**    Diagnosis and management of ophthalmic zoster sine herpette accompanied by cervical spine disc protrusion: A case report  
*Yun G, Kim E, Baik J, Do W, Jung YH, You CM*
- 7593**    Hemorrhagic pericardial effusion following treatment with infliximab: A case report and literature review  
*Li H, Xing H, Hu C, Sun BY, Wang S, Li WY, Qu B*
- 7600**    Wernicke's encephalopathy in a rectal cancer patient with atypical radiological features: A case report  
*Nie T, He JL*
- 7605**    Total hip revision with custom-made spacer and prosthesis: A case report  
*Liu YB, Pan H, Chen L, Ye HN, Wu CC, Wu P, Chen L*

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# Treatment of lower part of glenoid fractures through a novel axillary approach: A case report

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## Abstract

### BACKGROUND

Based on the location and size of the fracture block, open reduction and internal fixation can be employed or assisted for shoulder arthroscopy in the treatment of glenoid fractures. However, the treatment of lower part of glenoid fractures through a novel axillary approach has not been reported so far.

### CASE SUMMARY

A 22-year-old right-handed man was transferred to our outpatient clinic because of right shoulder injury during a traffic accident. X-ray examination after admission suggested the fracture of the lower part of the right glenoid and an ipsilateral proximal humeral fracture. Three-dimensional (3D) computed tomography (CT) further suggested that the size of the fracture block of the lower part of the right glenoid was 3.4 mm × 16.2 mm. The patient was diagnosed as the fracture of the lower part of the glenoid, also known as bony Bankart lesion without shoulder dislocation. After general anesthesia, the patient was surgically treated with the open reduction internal fixation through a novel axillary approach. 3D CT and shoulder joint function were reexamined at 12 mo of follow-up, showing acceptable recovery.

### CONCLUSION

This case report describes a novel axillary approach adopted in an open reduction with cannulated screw and wire anchor internal fixation. After a follow-up for more than 12 mo, 3D CT and shoulder joint function examinations display a good recovery.

**Key Words:** Glenoid fracture; Approach; Operative technique; Case report

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**Core Tip:** Based on the location and size of the fracture block, open reduction and internal fixation can be employed or assisted for shoulder arthroscopy in the treatment of glenoid fractures. However, the treatment of lower part of glenoid fractures through a novel axillary approach has not been reported so far. This study reports a case with lower part of glenoid fracture and treated with open reduction with cannulated screw and wire anchor internal fixation through a novel axillary approach. After a follow-up for more than 12 mo, reexaminations of three-dimensional computed tomography and shoulder joint function display a good recovery.

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## INTRODUCTION

Generally speaking, scapular fractures are often caused by high-energy trauma in traffic accidents[1]. Intra-articular fractures account for 1% of scapular fractures[2]. Glenoid fractures take up nearly 0.1% of total body fractures and 10% of scapular fractures[3]. The treatment of glenoid fracture depends on the size and displacement of the fracture fragments, including non-surgical treatment, open surgery, or open surgery with arthroscopy[4]. Schofer *et al*[5] suggested that the functional effects are significant after the conservative treatment of scapular fractures. However, Rollo *et al* [6] considered that non-surgical treatment of scapular fractures may cause pain, vascular problems, delayed union, malunion, persistent shoulder symptoms, or loss of arm function. Most of the Bankart lesions in the anterior and posterior glenoid fractures and superior labrum anterior and posterior lesions to the glenoid can be treated by surgery under arthroscopy[7-9]. However, the lower part of the glenoid fractures, especially large fracture masses, are difficult to be surgically treated with arthroscopic reduction and fixation, and open reduction internal fixation (ORIF) is recognized as a better choice for these specific cases[1,8]. It is generally known that the axillary has a relatively complex anatomical structure, and there are considerably important blood vessels and nerves passing through the axillary.

Accordingly, a novel axillary approach should be adopted during surgical treatment of the lower part of glenoid fractures, which can prevent the damage to the axillary vessels and nerves as much as possible, but clearly expose the fracture area of the subaxillary glenoid. Thus, a novel axillary approach from the muscle space was designed to make sure that the lower part of the glenoid fractures could be successfully reduced and fixed.

## CASE PRESENTATION

### Chief complaints

A 22-year-old right-handed man suffered from right shoulder pain for 24 h because of the traffic accident.

### History of present illness

The patient had right shoulder pain with limited movement, and could not raise the right arm. No abnormal sensation in the right upper limb was examined.

### History of past illness

The patient denied the history of right shoulder disease and operation.

### **Physical examination**

Physical examinations showed right shoulder tenderness, limited movement of the right shoulder, no numbness, limited finger movement, and vascular injury.

### **Laboratory examinations**

The results of preoperative laboratory examinations were normal.

### **Imaging examinations**

X-ray examination after admission suggested the lower part of the right glenoid fracture with an ipsilateral proximal humeral fracture (Figure 1A). Three-dimensional (3D) computed tomography (CT) further suggested that the size of the fracture block was 3.4 mm × 16.2 mm (Figure 1B).

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## **FINAL DIAGNOSIS**

According to the history and preoperative imaging examination, the patient was finally diagnosis as the lower part of the right glenoid fracture with an ipsilateral proximal humeral fracture.

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## **TREATMENT**

On day 5 after the injury, the patient was surgically treated by ORIF through a novel axillary approach following general anesthesia. The patient was placed on a fluoroscopic operating table in a lateral position. A longitudinal incision was made in the armpit, followed by exposure of the anterior edge of the latissimus dorsi by separating subcutaneous tissues (Figure 2A and B). The axillary nerve under the latissimus dorsi was exposed and separated, which was traversed from the medial side of the armpit to the lateral side. Subsequently, the posterior brachial circumflex artery and vein, under the axillary nerve, were exposed. The blood vessels and nerves were protected by a tender traction. Next, the joint capsule of lower part of the glenoid was exposed between the gap of axillary nerve and circumflex blood vessel (Figure 2C and D). Moreover, the joint capsule was cut transversely to expose the fracture block, fracture end and articular surface of the glenoid. Anatomic reduction was achieved under a direct vision. After the fracture reduction, two 1.5 mm fine Kirschner wires were used for temporary fixation, and then the fracture block was fixed with one cannulated screw (3 mm in diameter, 18 mm in length), and then two 2.7 mm wire anchors were used to strengthen the fixation (Figure 2E). After removal of the glenohumeral joint under a direct vision, the fracture block was exposed and fixed stably. The gauze equipment was counted, and the wound was washed and sutured layer by layer.

Another anteromedial approach of the shoulder joint under the same body position was adopted for surgical treatment of the ipsilateral proximal humeral fracture. After open reduction, the proximal humeral locking plate was used for fixation.

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## **OUTCOME AND FOLLOW-UP**

The patient's forearm was suspended for 3 wk postoperatively. Postoperative exercises of the elbow, wrist and hand were encouraged during the first 3 wk. A passive range of motion exercises were initiated at the third wk. At the sixth wk, patients were instructed to start active auxiliary exercises. During the follow-up period for more than 12 mo, imaging (including fracture of subaxillary glenoid and ipsilateral proximal humeral) (Figure 1) and functional examinations were conducted (Table 1).

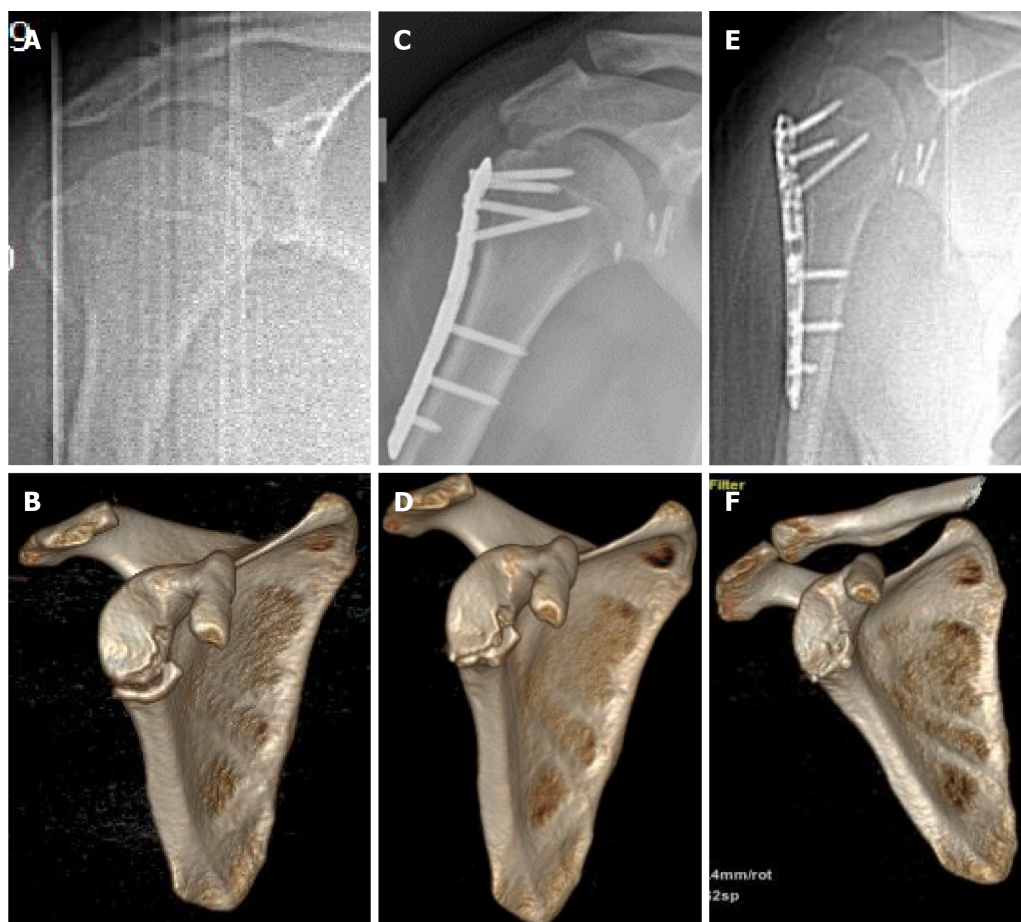
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## **DISCUSSION**

Ideberg classification of scapular fractures is the most common classification of intra-articular glenoid fractures. The classification system is modified by Goss, involving 6 types of fractures[10]. Among them, type II fractures are those of the lower part of the glenoid, which induce the instability and dislocation of the shoulder joint[11]. If surgical treatment is required, reduction and wire anchor fixation for small fractures

Table 1 Demographic data and results of following

| Case number | Sex  | Age (yr) | Mechanism of Injury | Ideberg fracture classification | Follow-up time (mo) | Postoperative constant score | Postoperative bone healing |
|-------------|------|----------|---------------------|---------------------------------|---------------------|------------------------------|----------------------------|
| 1           | Male | 22       | Traffic accident    | Type II                         | 12                  | 95                           | Bony union                 |

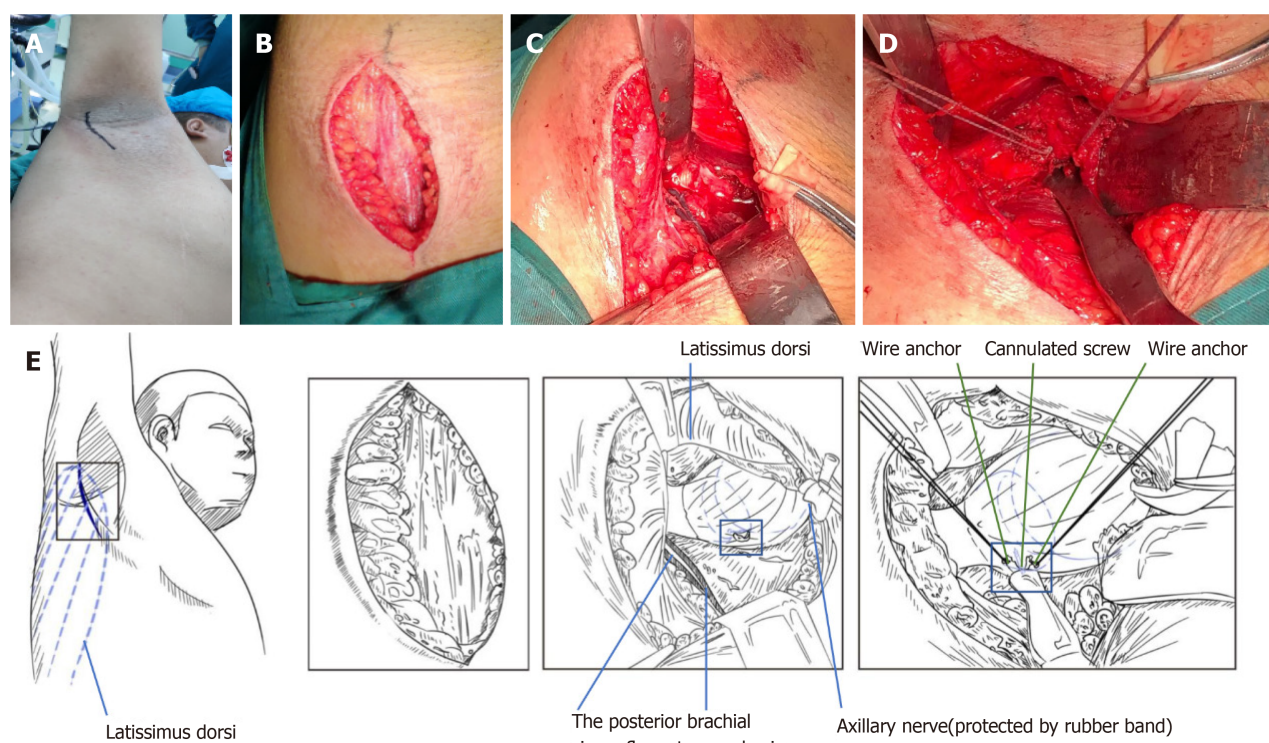


**Figure 1** Preoperative and postoperative radiography images of the patient. A: Preoperative X-ray; B: Preoperative three-dimensional (3D) reconstruction; C: X-ray image at 1 wk postoperatively; D: 3D reconstruction at 1 wk postoperatively; E: X-ray image at 12 mo postoperatively; F: 3D reconstruction at 12 mo postoperatively.

can be performed under the shoulder arthroscopy. However, arthroscopic reduction and fixation are difficult to be performed in cases with large fracture masses or those with the scapular neck involved. van Oostveen *et al*[12] believed that appropriate surgical methods according to different types of fractures can achieve satisfactory results.

In this study, a novel axillary approach in the lateral decubitus position was designed. It is generally known that the axillary has a relatively complex anatomical structure, and there are considerable important blood vessels and nerves passing through the axillary. Vascular and nerve damage can be easily caused because of the complicated anatomical structure. The axillary approach proposed in this study was a novel approach initiated from the anterior edge of the latissimus dorsi and passed through the space between the axillary nerve and the circumflex scapular vessel (Figure 2). This approach can avoid the main blood vessels and nerves in the armpit, which also directly enters to the subscapular fracture area. Moreover, the proposed approach had multiple advantages like an easy exposure of the operation area, a direct access to the surgical site, achievement of fracture reduction and fixation under a direct vision, and prevention of the axillary nerve and vessel damages.

In the present study, the Constant score of shoulder joint reached 95 in the patient with inferior rim fractures of the glenoid after surgical treatment, which was better than the average Constant score of 82 reported by Bartoniček *et al*[13].



**Figure 2 Intraoperative photos and sketches.** A: Surgical marker; B: A longitudinal incision was made in the armpit, followed by exposure of the anterior edge of the latissimus dorsi by separating subcutaneous tissues; C: The posterior brachial circumflex artery and vein, under the axillary nerve, were exposed. The blood vessels and nerves were protected by a tender traction; D: The fracture block was fixed with one cannulated screw and two wire anchors were used to strengthen the fixation; E: The sketches more vividly describes the whole operation process.

Shoulder arthroscopy has great advantages in the treatment of Bankart lesions[14, 15]. Generally speaking, surgery is preferred to displaced glenoid fossa fractures[16]. However, when the shoulder arthroscopy fails to reduce and fix scapular glenoid fractures with other parts of the scapula, ORIF is a good choice[17,18]. Besides, ORIF is also suitable for fractures of the lower part of glenoid. Thus, the axillary approach was developed here. Besides the reduction and internal fixation of fresh fractures, the novel axillary approach was also proven to be a very good choice for patients with bone lesions, cysts, old fracture nonunion and subluxation of shoulder joint around the lower part of glenoid.

## CONCLUSION

This case report describes a novel axillary approach adopted in the open reduction with cannulated screw and wire anchor internal fixation. The patient was surgically treated by ORIF through the novel axillary approach following general anesthesia. After a follow-up for more than 12 mo, 3D CT and shoulder joint function reexaminations showed a good recovery.

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