Cardiol, 2015, 66(13): 1456-1466.

[10] Narula S, Shameer K, Omar AMS, et al. Machine-learning algorithms to automate morphological and functional assessments in 2D echocardiography[J]. J Am Coll Cardiol, 2016, 68(21): 2287-2295.

[11] Omar AMS, Narula S, Abdel Rahman MA, et al. Precision phenotyping in heart failure and pattern clustering of ultrasound data for the assessment of diastolic dysfunction[J]. JACC Cardiovasc Imaging, 2017, 10(11): 1291-1303.

[12] Muse ED, Topol EJ. Guiding ultrasound image capture with artificial intelligence[J]. Lancet, 2020, 396(10253): 749.

[13] Betancur J, Otaki Y, Motwani M, et al. Prognostic value of combined clinical and myocardial perfusion imaging data using machine learning[J]. JACC Cardiovasc Imaging, 2018, 11(7): 1000-1009.

[14] Kwon JM, Kim KH, Jeon KH, et al. Development and validation of deep-learning algorithm for electrocardiography-based heart failure identification[J]. Korean Circ J, 2019, 49(7): 629-639.

[15] Chu LC, Anandkumar A, Shin HC, et al. The potential dangers of artificial intelligence for radiology and radiologists[J]. J Am Coll Radiol, 2020, 17(10): 1309-1311.

[16] Sengupta PP, Kulkarni H, Narula J. Prediction of abnormal myocardial relaxation from signal processed surface ECG[J]. J Am Coll Cardiol, 2018, 71(15): 1650-1660.

[17] Madani A, Arnaout R, Mofrad M, et al. Fast and accurate view classification of echocardiograms using deep learning[J]. NPJ Digit Med, 2018, 1(1): 6.

[18] Rogers W, Thulasi Seetha S, Refaee TAG, et al. Radiomics: from qualitative to quantitative imaging[J]. Br J Radiol, 2020, 93(1108): 20190948.

[19] Pal P, Ghosh S, Chattopadhyay BP, et al. Screening of ischemic heart disease based on PPG signals using machine learning techniques[J]. Annu Int Conf IEEE Eng Med Biol Soc, 2020, 2020(7): 5980-5983.

[20] Barda AJ, Horvat CM, Hochheiser H. A qualitative research framework for the design of user-centered displays of explanations for machine learning model predictions in healthcare[J]. BMC Med Inform Decis Mak, 2020, 20(1): 257.

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·病例报道·

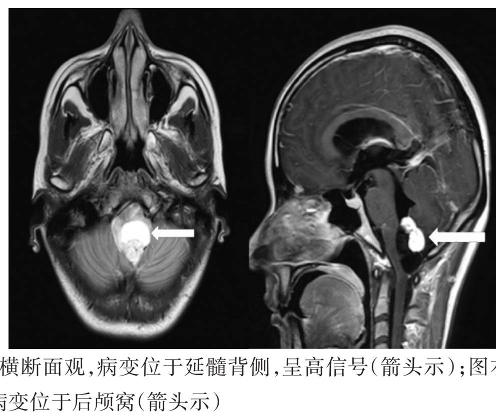
Ultrasonic exploration of acute supratentorial hematoma during resection of posterior fossa tumor: a case report

超声探查后颅窝肿瘤切除术中并发急性幕上血肿1例

花　悦　程令刚　王福民　何　文

［中图法分类号］R445.1　　［文献标识码］B

患者女，29岁，两年前间断出现呃逆症状，食欲差，体质量减轻1年，3个月前无明显诱因出现头痛，伴恶心、呕吐，偶有走路左侧偏斜1个月。头颅MRI检查：后颅窝多发占位，考虑多发血管母细胞瘤（图1）。行后颅窝肿瘤切除术，先行枕下后正中切口，见肿瘤位于延髓背侧，与小脑蚓部、小脑扁桃体粘连紧密，术中肿瘤切除完成并彻底止血后，患者突发颅内压增高、急性脑膨出。随即使用术中超声进行实时探查，超声所见：幕上区域左侧额颞叶骨板下方见一梭形高回声区，距后颅窝骨窗深约6.0 cm，范围约1.8 cm×5.5 cm，边界清，形态规则；CDFI未探及明显血流信号（图2A）。15 min后再次行超声检查：梭形高回声区面积增大，范围约4.1 cm×7.2 cm，性质同前（图2B）；提示病变为位于左侧额颞叶的硬膜外血肿。于超声监测下清除部分血肿，左侧额颞叶血肿较前缩小，范围约1.8 cm×6.5 cm（图2C）。因残余血肿位置较深，行额颞开路进一步清除血肿，铣额颞骨瓣行硬膜外血肿清除并骨瓣复位。术后患者CT检查示左侧颞顶叶血肿部位未见明显异常（图2D），生命体征正常。



图左为横断面观，病变位于延髓背侧，呈高信号（箭头示）；图右为矢状面观，病变位于后颅窝（箭头示）

图1　术前头颅MRI图

（下转第697页）

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perineology:a case series[J].BMC Surg,2004,4(1):15.

[9] Stav K,Dwyer PL,Roberts L.Pudendal neuralgia.Fact or fiction? [J] Obstet Gynecol Surv,2009,64(3):190-199.

[10] Srivastava D.Efficacy of sacral neuromodulation in treating chronic pain related to painful bladder syndrome/interstitial cystitis in adults [J].J Anaesthesiol Clin Pharmacol,2012,28(4):428-435.

[11] Mahran A, Baaklini G, Hassani D, et al. Sacral neuromodulation treating chronic pelvic pain:a meta-analysis and systematic review of the literature[J].Int Urogynecol J,2019,30(7):1023-1035.

[12] Rigoard P, Delmotte A, Moles A, et al. Successful treatment of pudendal neuralgia with tricolumn spinal cord stimulation: case report[J].Neurosurgery,2012,71(3):757-763.

[13] Konschake M,Brenne E,Moriggl B,et al.New laparoscopic approach to the pudendal nerve for neuromodulation based on an anatomic study[J].Neurourol Urodyn,2017,36(4):1069-1075.

[14] Cvetanovich GL, Saltzman BM, Ukwuani G, et al. Anatomy of the pudendal nerve and other neural structures around the proximal hamstring origin in males[J].Arthroscopy,2018,34(7):2105-2110.

[15] Bendtsen TF,Parras T,Moriggl B,et al.Ultrasound-guided pudendal nerve block at the entrance of the pudendal (Alcock) canal: description of anatomy and clinical technique[J].Reg Anesth Pain Med,2016,41(2):140-145.

[16] Fang HW, Zhang JY, Yang Y, et al. Clinical effect and safety of pulsed radiofrequency treatment for pudendal neuralgia: a prospective, randomized controlled clinical trial [J]. J Pain Res, 2018,11(10):2367-2374.

[17] Gruber H,Kovacs P,Piegger J,et al.New,simple,ultrasound-guided infiltration of the pudendal nerve:topographic basics[J].Dis Colon Rectum,2001,44(9):1376-1380.

[18] Hong MJ,Kim YD,Park JK,et al.Management of pudendal neuralgia using ultrasound-guided pulsed radiofrequency:a report of two cases and discussion of pudendal nerve block techniques[J].J Anesth, 2016,30(2):356-359.

[19] Nobre LV,Cunha GP,Sousa PCCB,et al.Peripheral nerve block and rebound pain:literature review[J].Rev Bras Anestesiolv,2019,69(6): 587-593.

[20] Abu-Zaid A, Alomar O, Abuzaid M, et al. Ropivacaine versus lidocaine infiltration for postpartum perineal pain: a systematic review and meta-analysis[J].J Gynecol Obstet Hum Reprod Actions, 2021,50(8):102074.

[21] Singh S,Melnik M.Domain heterogeneity in radiofrequency therapies for pain relief:a computational study with coupled models[J]. Bioengineering(Basel),2020,7(2):35.

[22] Ojango C, Raguso M, Fiori R, et al. Pulse-dose radiofrequency treatment in pain management-initial experience[J].Skeletal Radiol, 2018,47(5):609-618.

[23] Vatansever D, Tekin I, Tuglu I, et al. A comparison of the neuro ablative effects of conventional and pulsed radiofrequency techniques [J].Clin J Pain,2008,24(8):717-724.

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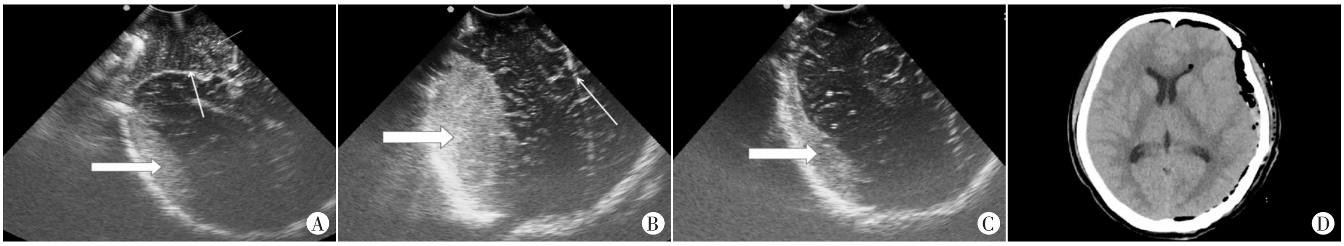

A:超声示血肿位置(粗箭头示颅内血肿,细长箭头示小脑幕,细短箭头示小脑半球);B:超声示15 min后颅内血肿范围增大(粗箭头示颅内血肿,细箭头示大脑镰);C:超声监测下清除部分血肿,范围较前缩小(粗箭头示颅内血肿);D:术后头颅CT示左侧颞顶叶开颅术后血肿清除

图2 术中超声及术后CT图

讨论:急性脑膨出是神经外科开颅手术中的急重症之一,严重时可危及生命。其在术中发生的原因主要有两方面:迟发性颅内血肿和急性弥漫性脑肿胀[1]。本例患者发生急性脑膨出的原因为非手术区(幕上)的颅内硬膜外血肿形成。颅内血肿是颅内肿瘤切除术的一种常见且严重的并发症,而非手术区域的硬膜外血肿发生率较低。本例患者发生幕上硬膜外血肿的原因可能为额颞部头架钉固定过紧,穿破颅骨导致血管损伤。此外,脑实质移位、凝血功能改变均可能为开颅手术中并发非手术区域颅内血肿的原因。以上因素均会导致硬脑膜与颅骨内板剥离,引起板障静脉甚至脑膜动脉受损,从而形成非手术区硬膜外血肿[2]。本例患者急性脑膨出且血肿范围进行性增大,若快速实施关颅或行颅内减压术,并急诊复查CT,整体耗时长,患者致死致残率高,且术中CT仪器体积大,可操作性、连续性差,不能实时动态反映血肿情况。术中超声安全、价廉、操作简便,对于术中颅内压升高甚至脑膨出的患者,可实时探查病因,明确位置,提高手术准确性,避免盲目探查对脑组织造成二次损伤。术后行超声检查也能准确显示血肿清除程度,避免残留。总之,超声对术中急性非手术区血肿具有重要诊断和监测意义,有助于临床医师及时制定治疗方案,最大程度地降低对患者的伤害。

参考文献

[1] 周业,王盛,吴杰.颅脑损伤患者外科治疗中发生急性脑膨出的影响因素研究[J].中国现代医学杂志,2015,25(27):103-107.

[2] Chung HJ,Park JS,Park JH,et al.Remote postoperative epidural hematoma after brain tumor surgery[J].Brain Tumor Res Treat,2015, 3(2):132-137.

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