经颅多普勒超声对脑死亡的观察

(4例报告及文献复习)

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摘要 应用经颅多普勒(TCD)超声仪动态观察了4例临床脑死亡病例演变过程。发现4例均有相似的变化:首先表现为大脑中动脉血流频谱切迹加深,舒张末期流速值(Vd)进行性下降,脉博指数(PI)增高;继之,Vd消失,PI继续增高;最后出现舒张期逆向流速,形成特征性"双向TCD"波型,直至TCD信号消失,患者进入临床脑死亡状态。说明TCD是诊断脑死亡的有用手段。

关键词 经颅多普勒超声 脑死亡 脑损伤

脑死亡的诊断目前尚无统一标准,检查手段有:同位素脑扫描,颈动脉造影,脑电图和脑诱发电位[1]等,而用经颅多普勒(Transcranial Doppler,TCD)超声技术观察脑死亡,国内尚未见报道。我们应用英国Doptek公司生产的彩色TCD仪观察了4例临床脑死亡患者的大脑中动脉(MCA)血流频谱演变过程,现结合文献复习,报告如下。

病 例 报 告

例1,男,40岁。因车祸昏迷3小时入院。双瞳孔光反应好。GCS 5分。头颅CT无异常。TCD示:MCA舒张期流速(Vd)下降,重搏波切迹(DN)加深(图1),脉搏指数(PI)略高;2小时后复查:Vd继续下降,PI增高。3小时后Vd为零(图2)。4小时后Vd为逆向血流(图3)。收缩期流速(Vs)与Vd的时间平均值(TAM)10cm/s。持续半小时后Vs明显降低,TAM为5cm/s。双瞳孔散大,呼吸停止,即行人工辅助呼吸。又半小时心跳停止,TCD消失。

例2,男,27岁。头外伤后昏迷1小时入院。双瞳孔散大,无光反应。GCS 4分。TCD示:Vs为正向,Vd为逆向,TAM为13cm/s。半小时后,Vs和Vd均减小,TAM为6cm/s。呼吸停止时TCD仅见低幅Vs,继之心跳停止。

例3,男,2岁。跌倒后昏迷半小时入院。双瞳孔光反应弱,GCS 5分。Vd消失,半小时后为逆向血流,1小时后Vd几乎等于正向的Vs,TAM 4cm/s。90分钟后呼吸停止,Vs极弱,继而心跳停止。

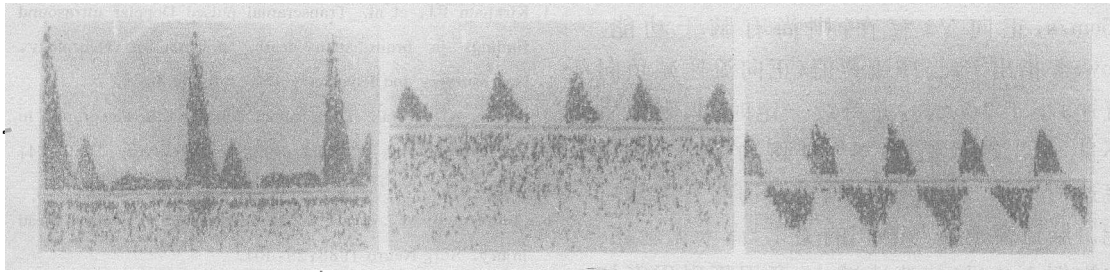

图1 入院时 图2 3小时后 图3 4小时后

例4,女,4个月。从五楼坠落4小时后入院。 嗜睡,前囟平软。GCS 9分。头颅CT见双额

少量硬膜下积液。TCD 示 Vd 略低，余正常。4 小时后前囟张力略高，DN 加深。8 小时后，前囟张力明显增高，浅昏迷，Vd 明显降低，PI 增高。立即静脉点滴甘露醇 40ml，前囟张力稍降，Vd 上升，DN 变浅，PI 下降。因拒绝手术，上述状况反复 4 次。24 小时后右瞳孔散大，光反应迟钝。颅压继续增高。第三天，中度昏迷，Vd 呈逆向血流，持续存在，TAM 为 5 cm/s。第四天，TCD 信号消失，呼吸，心跳先后停止。

讨　论

颅底大血管血流停止，可预示有脑死亡可能[2]。脑死亡的原因多为持续性颅内压（ICP）增高。ICP 的变化直接影响脑血流量（CBF）。虽然 TCD 不能测量 CBF，但可测量脑血流速度的动态变化。已证实流速与 CBF 呈高度相关性[3]。随着 ICP 增加，达舒张压水平时，脑血管完全麻痹。ICP 进行性升高，终将耗竭代偿机制，使得舒张的血管塌陷，此时 TCD 显示收缩期顺流和舒张早、晚期逆流。ICP 增高时，Vd 进行性减慢直至为零。若进一步发展，Vd 可出现逆向血流，甚至只能观察到收缩初、中期短暂血流，最后全部 TCD 信号消失。临床表现出脑死亡征象[2]。本组 TCD 所见与国外报道相似。此外，我们曾将颅内压监护与 TCD 结合，观察到 ICP 变化和脑血流速度改变有某种定量关系，与上述演变过程相一致。有人报道[4]MCA 流速小于 10cm/s，正向 Vd 缺如，此时脑干反射消失。若 TAM 为 10～25cm/s，正向 Vd 存在，则尚有脑干功能。Powers 指出[5]：当净流速值（正向流速减负向流速）小于 10cm/s，并持续一定时间，则预后不良，可出现脑死亡，本组 4 例均如此。当净流速值大于 20cm/s 时，则神经功能有恢复可能。脑血流速度与意识的关系，尚未见论述。本文例 1、4 显示：流速减小，意识障碍程度加深。我们认为，流速减小，CBF 亦少，大脑皮层供血不足，因而意识障碍加深。

Saunders 研究了 ICP 与流速的关系[6]。ICP 增高，Vs 高尖，DN 加深，Vd 下降。说明 ICP 变化可引起血流频谱的改变。本组 4 例演变中均有特征性双向（to -and -fro）TCD 波型。能否将这种双向波作为预示脑死亡的标志，有待进一步观察。

PI 反映的是血管搏动状态，ICP 升高，血流阻力增大。颅内动脉干的搏动由生理状态下的弱搏动变为强搏动，类似于外周大动脉干要克服较大阻力而表现的强搏动，本组的 PI 均增大。

我们观察到用甘露醇降颅压后，TCD 示流速增加。可能除降颅压作用外与甘露醇直接疏通血流和减少血液的粘滞度等有关。脑灌注主要在心动周期的舒张期内，而甘露醇可提高 Vd 值，显然可改善脑灌注。因此，可在 TCD 监测下，采取有效措施，改善并维持脑血流，以避免脑死亡发生。

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major complication. (original article on page 72)

Key words: Rod-sleeve instrumentation thoracolumbar fracture paraplegia

Reconstruction for Musculocutaneous Defects in Masseteric Region Following Firearm Wound

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This study is based on anatomical observation and measurement of sternocleidomastoid muscle and masseteric region on 50 cadavers (totally 100 sides). It provides reliable data for clinical design and empoyment of the sternal end of the sternocleidomastoid muscle for the myocutaneous flap repair of musculocutaneous defects in the masseteric region following firearm wounds. There has been no flap failure except minimal donor site complications in 6 patients undergoing these reconstructions. Advantages of the use of myocutaneous flap over prevoius reconstructive methods are the availablity of dual blood supples and preservation of both motor and sensory nerve innervatoins. The successful results following these reconstructive operations showed much better restoration of masticatory function and far earlier recovery of skin sensation. (original article on page 77)

Key words: firearm wound masseteric region defect functional reconstruction

Stress Ulcer Resulting from Fracture and Its internal Fixation

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Ten cases of stress ulcer were seen from 1979 to 1988 after fracture, 7 after serious fracture and 3 after open reduction and internal fixation. Gastrointestinal tract bleeding appeared 2-10 day after injury. Diagnosis was confirmed through gastroscope in 5 cases and exploratomy laparotomy in 2 cases. Erosion and ulcer formation of the gastric mucous membrane was found during operation. Conservative treatment was adopted with success. Partial gastrectomy with selective vagotomy (or additional suture ligation) were done in the 2 other cases with recovery when conservative treatment proved failure. One died. Pathogenesis of stress ulcer is discussed. Endoscopy was recommended for diagnosis. If conservative method proved failure, surgical procedure should be performed for prompt hemostasis. (original article on page 80)

Key words: stress ulcer fracture

Evaluation of Brain Death by Using Transcranial Doppler

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Transcranial doppler (TCD) was used to measure the flow velocities of middle cerebrial artery (MCA) in 4 patients of clinical brain death. The reaults showed that the changes were similar in all the patients studied; 1) the dierotic notch (DN) was deeper in the spectrum of flow velocities of MCA, end diastolic flow rate (VD) significantly decreased, and the pulastility index (PI) increased; 2)VD decreased progressively; 3) all patients showed characteristic to-and-fro TCD pattren with antegrade flow in systole and retrograde flow in diastole; 4) the pattern totally disappeared when the patients were claimed dead. It is found that TCD is valuable for the determination of brain death. (original article on page 83)

Key words: transcranial doppler brain death