短　篇

敌草快中毒性脑病一例报道及影像学分析*

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【摘要】敌草快是一种非选择性速效灭生性除草剂，与百草枯同属联吡啶类化合物。据报道，美国敌草快中毒以职业相关因素为主(8%~44%)，且病死率低(<1%~3%)。我国是于近年来禁止百草枯后，敌草快才在市场中普及，因此对敌草快中毒的认识不足，病死率显著高于发达国家。敌草快主要损害靶器官为肝和肾，对中枢神经系统也有累及。本文主要报道一例年轻女性误服敌草快致严重的中枢神经系统损伤的案例，该患者存在典型的敌草快中毒性脑损伤临床及影像学表现，具有一定指导意义。

【关键词】敌草快中毒；中毒性脑病；影像学；临床特征
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Diquat Toxic Encephalopathy: A Case Report and Imaging Analysis*

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ABSTRACT

Diquat is a non selective, fast acting, inactivating herbicide that is in the same bipyridyl class as paraquat. It has been reported that diquat poisoning in the United States is dominated by occupation related factors (8%~44%), and the mortality is low (< 1%~3%). Our country is only popular in the market after the prohibition of paraquat in recent years, so the understanding of diquat poisoning is insufficient and the mortality is significantly higher than that of developed countries. Diquat mainly damages target organs as liver and kidney, and also has central nervous system involvement. In this paper, we mainly reported a case of severe CNS injury caused by mistaking diquat to a young female, who had typical clinical and imaging findings of toxic brain injury caused by diquat, which was instructive.

Keywords: Diquat Poisoning; Toxic Encephalopathy; Imaging; Clinical Features

病例：患者女性，16岁，口服敌草快混合液 (敌草快20%浓度，患者将农药与约等量清水混合后口服)约120mL，后有少量呕吐，于当地医院洗胃治疗，服药后5小时转至我院急诊。急诊检查：白细胞计数18.9×10^9/L↑，中性粒细胞百分率89.2%↑，活化部分凝血活酶时间22.5秒。查体发现患者稍烦躁，部分查体不合作，口角震颤。入院后完善实验室检查，较前出现明显肝肾及凝血功能不全。同时行血液毒物定性及定量分析，血液中检出敌草快，浓度为63.7ng/mL。

入院第3日，患者出现呼吸功能衰竭、浅昏迷，血气提示低氧血症，予气管插管机械通气辅助呼吸。查头颅CT提示：脑干弥漫性密度减低(图1)。入院第9日，患者神志清，血流动力学稳定。入院第17日，拔除气管插管。入院一个月，完善头颅MRI提示：脑干及小脑萎缩，脑桥呈稍长T_1短T_2信号，DWI、FLAIR呈低信号(图2~图5)；SWI幅值图显示脑干上述异常信号区呈低信号，考虑为大量含铁血黄素沉积表现(图6)。

1 讨　论

敌草快是一种非选择性速效灭生性除草剂，与百草枯同属联吡啶类化合物。据报道，美国敌草快中毒以职业相关因素为主(8%~44%)，且病死率低(<1%~3%)[1-2]。我国是于近年来禁止百草枯后，敌草快才在市场中普及，因此对敌草快中毒的认识不足，病死率显著高于发达国家。根据我国一项43例的多中心数据[3]：院内病死率为18.6%，随访校正后28天病死率为60.0%。另有单中心数据分别显示死亡率为16.7%[4]和28.6%[5]。敌草快有着吸收率低、分布迅速、分布广泛的特点[6]，与其他季铵化合物相比对肺泡上皮细胞损伤不严重[7]。敌草快主要通过氧化应激造成靶器官损害，主要靶器官为肝和肾，对中枢神经系统也有累及[8]。本例患者误服敌草快致肝、肾、肺损害，伴严重的中枢神经系统损伤。

本例患者早期出现了明显的意识障碍、烦躁等脑损伤表现，说明其存在中毒性脑病。既往报道的敌草快脑损伤较为少见，曾有少量报道称患者出现了脑出血、脑梗塞[9]，也有案例报道了患者出现了脑干出血和梗塞[10]。本案例在颅脑的影像学表现上，发现脑干为主要的损伤部位，早期颅脑CT平扫发现脑干密度弥漫性减低，提示脑干损伤、肿胀，而中毒一月后的颅脑MRI上发现脑干出现片状稍长T_1短T_2信号，DWI、FLAIR呈低信号。中毒40天后的SWI幅值图显示脑干上述异常信号区呈低信号，考虑为大量含铁血黄素沉积表现。这说明患者可能出现了脑干水肿、血脑屏障破坏及微循环出血可能，大脑未显示异常改变，这也与之前的报道相一致。患者病程中出现了呼吸衰竭和意识障碍，考虑是脑干水肿引起的呼吸中枢抑制及网状激活系统受损。这可能由于敌草快在体内的再分布到达脑干部位引起的神经毒性。有趣的是，这同样是季铵类化合物的百草枯并不相同，根据既往的报道，百草枯引起的神经中毒现象影像学表现主要为大脑微循环的出血，或者额叶、顶叶、颞叶的脑实质水肿，而很少有报道出现脑干病变。

多个案例报道了敌草快会造成桥脑髓鞘溶解现象[11]，本例的病变位置酷似脑桥中央髓鞘溶解症。敌草快引起神经损伤的具体机制尚不明确，推测主要为激活氧化应激反应，敌草快有着较高的氧化还原电位，进入机体经NADPHII和CYP450代谢后产生大

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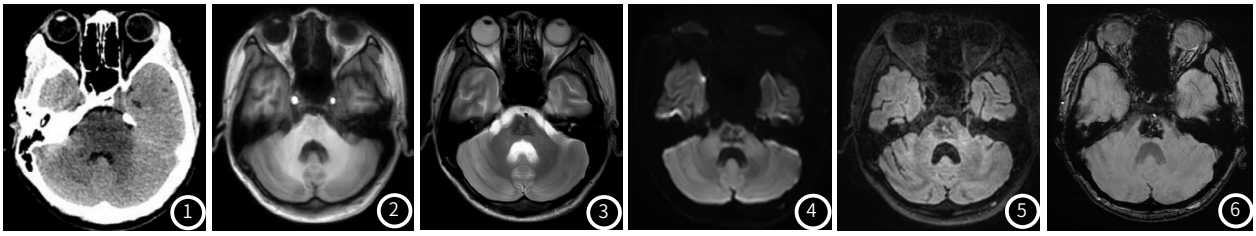
量的超氧离子自由基，进一步引起大量ROS释放，而GSH等保护性物质则难以承受大量ROS的氧化，失去保护作用，从而引起细胞的氧化应激损伤[8]，导致细胞的凋亡、死亡、自噬等反应的产生，尤其是自噬反应。据报道敌草快可以通过MAPK, ERK, JNK, mTOR通路来调节自噬[12]。细胞自噬被报道在神经脱髓鞘性病变中存在着重要作用[13]，这可能解释本例的病变位置酷似脑桥中央髓鞘溶解症。本例另一影像学特征——出血，也与先前报道中脑桥中央髓鞘溶解症可存在出血病变相符合[14]。另一方面，敌草快会显著降低多巴胺能神经元的活性[15]，而脑多巴胺神经元分布主要在中脑，这也可能解释为什么损伤发生在脑干。

作为和百草枯同类的季铵类化合物，敌草快中毒在我国的认识尚不深入，敌草快中毒后各器官的损伤与百草枯等有明显的区别，这也提示我们需要关注其神经毒性和全身多脏器的状况。本病例的分析为诊疗提供了新的思路，具有一定的指导性意义。



患者，女，16岁，敌草快中毒性脑损伤。**图1** 为头颅CT，提示脑干弥漫性密度减低。**图2～图5** 分别为T_1WI、T_2WI、DWI及FLAIR，提示脑干及小脑萎缩，脑桥呈稍长T_1短T_2信号，DWI、FLAIR呈低信号。**图6** 为SWI，提示脑干上述异常信号区呈低信号。

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