

·临床研究·

眼眶异物DR角膜缝环定位法与CT三维重建定位法 临床价值评估

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摘要:【目的】探讨眼眶异物数字化放射摄影(DR)角膜缝环定位法与CT三维重建定位法临床价值。【方法】回顾性分析我院2016年1月至2020年12月收治的疑为眼部异物的患者作为研究对象,拟研究数量51例。同时做眼眶异物DR角膜缝环定位法和CT三维重建定位法,统计两种方法异物检出率,分析眼部异物的定位情况。【结果】采用眼眶异物DR角膜缝环定位法能分辨眼眶内异物者38例,采用CT三维重建定位法能分辨眼眶内异物者46例,CT三维重建定位法准确率90.20%高于眼眶异物DR角膜缝环定位法准确率74.51%($P<0.05$)。眼眶异物DR角膜缝环定位法能分辨出球内异物23例,CT三维重建定位法能分辨球内异物25例,其中CT三维重建定位法能分辨的球内异物最大径为(2.65 ± 0.14)mm,低于眼眶异物DR角膜缝环定位法能分辨的球内异物直径(2.94 ± 0.36)mm($P<0.05$)。眼眶异物DR角膜缝环定位法显示异物点钟位、异物到水平面距离、异物到矢状面距离及异物到两侧角巩膜缘连线距离与CT三维重建定位法结果相比无差异($P>0.05$)。采用CT三维重建定位法能比较清楚地分辨出眼内、外的40例高密度影;采用眼眶异物DR角膜缝环定位法有23例确定为眼球内高密度影,有15例高密度影无法确定是眼球内外($P<0.05$)。【结论】对于眼眶内异物定位来说,CT三维重建定位法分辨率高,定位准确,能检测眼球内部细微金属颗粒,可做眼部异物定位的常规方法,同时对于少数在虹膜根部、睫状体部、悬韧带外侧部的小异物定位,需配合眼眶异物DR角膜缝环定位法来定位。

关键词:眼眶异物;眼眶异物DR角膜缝环定位法;CT三维重建定位法;分辨率;高密度影

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Clinical Value Evaluation of DR Corneal Suture Ring Localization and CT 3D Reconstruction Localization of Orbital Foreign Body

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Abstract:【Objective】To investigate the clinical value of DR corneal suture ring localization and CT 3D reconstruction localization of orbital foreign bodies.【Methods】Retrospective analysis was performed on patients (51 cases) suspected of ocular foreign bodies admitted to our hospital from January 2016 to December 2020. At the same time, DR corneal suture ring localization and CT three-dimensional reconstruction localization of orbital foreign bodies were performed, and the detection rate of foreign bodies by the two methods was calculated to analyze the location of ocular foreign bodies.【Results】There were 38 cases of intraorbital foreign body identified by DR corneal suture ring localization method, and 46 cases of intraorbital foreign body identified by CT three-dimensional reconstruction localization method. The accuracy of CT three-

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dimensional reconstruction localization method was 90.20%, which was higher than that of DR corneal suture ring localization method 74.51% ($P < 0.05$). Intraocular foreign bodies in 23 cases could be distinguished by DR corneal suture ring localization, and 25 cases by CT 3D reconstruction localization. The maximum diameter of intraocular foreign bodies that could be distinguished by CT 3D reconstruction localization was (2.65±0.14) mm. The diameter of intraspherical foreign body was (2.94±0.36) mm ($P < 0.05$) lower than that which could be distinguished by DR corneal suture ring localization method. The results of DR corneal suture ring localization of orbital foreign body showed no difference compared with the results of CT 3D reconstruction localization ($P > 0.05$). Forty cases of high density images inside and outside the eye could be clearly distinguished by CT 3D reconstruction. By using DR corneal suture ring localization method, 23 cases were confirmed to be intraocular high-density shadows, and 15 cases could not be confirmed to be intraocular high-density shadows ($P < 0.05$).【Conclusions】 For the location of intraorbital foreign bodies, CT three-dimensional reconstruction can be used as a conventional method for locating ocular foreign bodies with high resolution and accuracy, and can detect fine metal particles inside the eyeball. Meanwhile, for a few small foreign bodies in the iris root, ciliary body and lateral suspension ligament, it is necessary to locate orbital foreign bodies with DR corneal suture ring.

Key words: orbital foreign body; DR corneal suture ring localization of orbital foreign body; CT 3D reconstruction positioning method; resolution; high density film

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眼部异物是眼科急症科、外伤科最常见疾病,其中包括铁、钢等在内的磁性金属异物,以及玻璃、碎石等在内的非磁性异物^[1]。根据眼部中存在异物的种类不同,有可能对眼部造成不同程度的损伤,若是性质较为稳定的异物如塑料、石头、玻璃等,便较少出现炎症反应;若是铁、铜等活泼金属异物,常常会引发视网膜病变和继发性青光眼等^[2]。根据异物所在位置可分为球外异物和球内异物,球外异物是指眼睑、结膜等处异物,会引起明显刺痛、肿胀等,球内异物是指异物穿过角膜、晶体,会引起角膜穿孔、眼球皱缩甚至眼周感染,即眼隔前与眼隔后感染,如弥漫性蜂窝织炎等^[3]。若不及时诊断治疗,异物长期留存在眼内可致视神经炎,甚至通过视神经管进入颅内,致颅内脑膜炎、脑脓肿和败血症,严重时可危及生命^[4]。列韵瑶等也曾在文中提到,角膜异物患者在24 h内就诊的效果会明显优于3 d内就诊的患者^[5],因此早期诊断并采取有效措施治疗是改善预后、保护视力的关键所在。临床常多采用数字化放射摄影(digital radiography, DR)和多层螺旋CT(multislice helical CT, MSCT)法等来辅助诊断检查异物大小部位和位置确定,进而为手术方案的制定提供可靠依据^[6-7]。眼眶异物DR角膜缝环定位法是对患者进行眼表麻醉,然后放入眼异物定位器,接着调整校准眼异物定位器位置,其能发现异物在眼眶内,但难以判断是球内球外^[8-10]。而CT三维重建定位分辨率较高,可准确分辨细微结构,对于DR角膜缝环定位法难以发现的金属异物也能分辨出^[11]。鉴于此,本文主要对眼眶

异物DR角膜缝环定位法与CT三维重建定位法进行临床价值评估,评估结果如下。

1 材料与方法

1.1 研究对象

选取我院2016年1月至2020年12月收治的51例疑为眼部异物的患者作为研究对象。入选标准:①眼部异物判定标准^[12]:眼底镜、裂隙灯等检查下可直视异物;眼部彩超、DR、CT等检查至少有两种检查存在异物。②受伤至检查时间 < 24 h。③高密度金属异物。④入院时异物未取出。⑤术前完成CT检查和DR角膜缝环定位两种检查。排除标准:①其他性质异物者。本研究51例疑为眼部高密度异物患者,均经手术确诊。男性患者44例,女性患者7例。患者右眼发病31例,左眼发病20例。患者年龄2~68岁,平均年龄为(37.76±5.22)岁。受伤后就诊时间为4~23 h,平均就诊时间(13.22±2.12)h。有48例为眼部高密度金属异物,有3例高密度影为非金属异物,1例为玻璃体硅油移位,2例为角膜白斑。本研究经中山眼科中心医学伦理委员会批准同意,并免知情同意书(2023KYPJ238)。

1.2 治疗方法

患者入院后,先对患者行眼眶异物DR角膜缝环定位法和CT三维重建定位法,统计两种方法分析眼部异物的定位情况。

1.2.1 眼眶异物DR角膜缝环定位法 采用DR机

拍角膜缝环定位片。采用数字化放射摄影DR机(德国西门子 Siemens Ysion Maxs),曝光参数70 KV/20 mAs、摄影距离120 cm。拍照前需在手术室进行角膜中央缝一环形金属标记物,叫缝环定位,有必要时,需要做更精准定位时,再做H型定位。缝环定位,常摄正、侧、轴位片及薄骨正、侧位片(图1),通过计算正位、侧位、轴位、经线位,测量各种数据,获取异物在眼内停留的位置,即异物的时钟位和眼内的深度。

1.2.2 CT三维重建定位法 采用多层螺旋CT机(荷兰飞利浦 Philips Access CT),曝光条件:120 KV/200 mAs 矩阵 512×512 , iDOSE: 4, FOV: 250 mm \times 250 mm, 滤波参数:SB, 层厚:1 mm/间距:0.7 mm, 窗位:30 HU, 窗宽:300 HU。建立眼球轴线:在轴位和矢状位上,经过晶体最大径和眼球赤道最大径中点垂直平分线,前后延伸通过角膜定点和眼球后极点(如图2)。设定角膜缘:在晶状体前缘作垂直于眼轴线的角膜缘线,与前壁交点即为角膜缘;确定异物方位:在多平面重建(MPR)冠状面图调节纠正偏位,在纠正后的横断面或矢状位上垂直眼轴线行冠状位重组,异物所在层面为方位测量图,测出异物方位;测量异物的角膜缘距:在异物所在的MPR冠状面,以异物中心和经眼中心连线作斜矢状面重组,在重组的矢状面图像测量异物中心距角膜缘平面距离。

1.3 观察指标及效果评价标准

①两种方法分辨眼眶内高密度异物例数与分辨准确率。②两种方法分辨球内高密度异物的性质及直径。③两种方法分辨眼眶内高密度异物点钟位、异物到水平面距离、异物到矢状面距离及异物到两侧角巩膜缘连线距离情况。④两种方法检测眼球内高密度影例数与检出率情况。

1.4 统计学方法

本研究采用SPSS 19.0统计学软件分析处理数据,计数资料用 $n/\%$ 表示,用 χ^2 检验,计量资料用 $(\bar{x} \pm s)$ 表示,用 t 检验,以 $P < 0.05$ 为差异具有统计学意义。

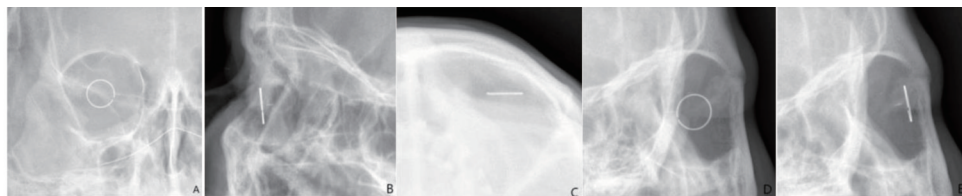
2 结果

2.1 两种定位方法对眼高密度异物分辨率的比较

采用眼眶异物DR角膜缝环定位法能分辨眼眶内异物者38例,采用CT三维重建定位法能分辨眼眶内异物者46例,CT三维重建定位法准确率90.20%高于眼眶异物DR角膜缝环定位法准确率74.51%($P < 0.05$;表1)。

2.2 两种定位法分辨球内高密度异物的直径

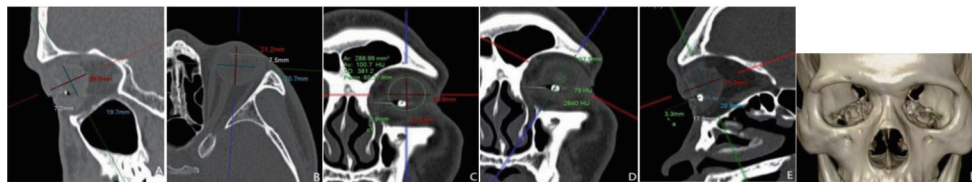
采用眼眶异物DR角膜缝环定位法能分辨球内异物23例,CT三维重建定位法能分辨球内异物25例,其中CT三维重建定位法能分辨的球内异物最大径低于眼眶异物DR角膜缝环定位法能分辨的球内异物直径($P < 0.05$;表2)。



A: positive position; B: side position; C: axis position; D: thin bone position; E: side position of thin bone.

图1 眼眶异物DR角膜缝环定位法

Fig. 1 DR of orbital foreign body by corneal suture ring positioning method



A: sagittal eye axis, equatorial line map; B: axial eye axis, equatorial line chart; C: bearing map of foreign body clock in coronal position; D: sagittal view of ON; E: measurement of foreign body limb a; F: VRT shows the location of the foreign body.

图2 CT三维重建定位法

Fig. 2 CT 3 D reconstruction and localization method

2.3 两种定位法显示异物情况

眼眶异物DR角膜缝环定位法显示异物点钟位、异物到水平面距离、异物到矢状面距离及异物到两侧角巩膜缘连线距离与CT三维重建定位法结果相比无差异($P>0.05$;表3)。

2.4 两种定位法检测眼球内外高密度影例数与检出率情况比较

采用CT三维重建定位法能比较清楚地分辨出眼内、外的40例高密度影;采用眼眶异物DR角膜缝环定位法有23例确定为眼球内高密度影,有15例高密度影无法确定是眼球内外($P<0.05$;表4)。

表1 两种定位方法对眼高密度异物分辨率的比较
Table 1 Comparison of two localization methods for the resolution of high density foreign bodies in the eye

[$n=51, n(\%), n$]		
Positioning method	The number of resolutions	The number of non-resolutions
DR method	38(74.51)	13
CT 3 D method	46(90.20)	5
χ^2	4.318	
P	0.038	

DR method: Orbital foreign body DR corneal suture ring positioning method; CT 3 D method: CT 3 D reconstruction and localization method.

3 讨论

眼眶穿刺伤多数会有明显动量,动量较小的颗粒穿透距离小,滞留在前房与晶体及悬韧带附近。动量较大的颗粒穿透距离长,异物可穿透眼球停留

表2 两种定位法分辨球内高密度异物的直径
Table 2 The diameter of the high density foreign bodies in the ball resolved by the two localization methods

[$n, (\bar{x} \pm s)$]		
Positioning method	n	Foreign body diameter/mm
DR method	23	2.94±0.36
CT 3 D method	25	2.65±0.14
t'		3.619 7
P		0.001 1

在眼球晶状体后面、赤道部、球后极部、或嵌在视网膜、脉络膜、巩膜上,或在视神经、眼外或嵌在骨壁上^[13]。往往合并外伤性白内障、眼球贯通伤、眼内容物脱出、玻璃体出血、积气等改变,甚至眼球破裂,同时合并患侧眼视神经损伤^[14],从而导致患者的眼内感染及视力损伤,甚至眼外视神经炎从而出现失明等并发症^[15-16]。因此,眶部异物尤其是球内及球后异物早期及时诊断、准确定位是手术的关键,及时摘除异物对预防感染、后期治疗,恢复眼球功能及预后有重要的临床意义^[17]。

在明确眼眶内异物后,需要先确定是眼球内异物,还是眼球外异物,通常DR进行患眼眶正、侧、薄骨位摄影,可以发现异物在眼眶内,无法判断是球内球外,因此在无CT扫描及后处理图像的情况下,常常需对患眼进行角膜缝环定位,必要时还需行角膜H型缝环定位^[18-19]。首先,术中在角膜上缝标记物,同时需要拍摄正位、侧位、轴位、薄骨正侧位片多方位影像,患者配合难度大。然后测量计算正位、侧位、轴位、经线位各种数据,获取异物在眼内停留的位置,即异物的时钟位和眼内的深度,可知

表3 两种定位法显示异物的点钟位、异物到指定位置的距离情况比较

Table 3 The two positioning methods show the oontime position of the foreign body and the distance from the foreign body to the designated location ($\bar{x} \pm s$)

Positioning method	n	Foreign matter o'clock position/mm	Distance of the foreign body to the horizontal plane/mm	Distance of the foreign body to the sagittal plane/mm	Distance of the foreign body to the angular scleral border line on both sides/mm
DR method	47	0.06±0.32	0.04±0.36	0.03±0.31	0.11±0.80
CT 3 D method	51	0.07±0.33	0.05±0.34	0.04±0.32	0.10±0.79
t		0.155	0.144	0.160	0.064
P		0.877	0.886	0.873	0.950

表4 两种定位法检测眼球内外高密度影例数与检出率情况比较

Table 4 Comparison of the number of high density cases and detection rate inside and outside the eyeball detected by the two localization methods

Positioning method	<i>n</i>	High-density shadow detection rate within the eyeball/ <i>n</i> (%)	Uncertain high-density shadow inside and outside the eyeball/ <i>n</i>
DR method	38	23(60.53)	15
CT 3 D method	46	40(86.96)	6
χ^2		7.752	
<i>P</i>		0.005	

异物具体位置,确定的在术中将异物取出,其过程比较复杂、繁琐^[20]。手术所需时间较长,很可能延误最佳治疗时机。同时对于一部分眼前段较小异物,用角膜缝环定位法无法明确判断异物是在眼球内还是在眼球外,存在一定的弊端^[21]。

CT三维重建定位法准确率90.20%高于眼眶异物DR角膜缝环定位法准确率74.51%,提示CT三维重建定位法定位准确。其原因可能为CT三维重建分辨率高,通过这种方法扫描层厚很薄,产生较少的组织重叠,可以清晰显示如眼外肌肿胀程度或眼眶内血肿位置和范围等眼部损伤^[22],可准确分辨细微结构,更为明显显示异物,且大部分异物包括金属、非金属的CT扫描不会被骨组织遮盖,可以获得连续的眼球断层图像,对于眼内的多个部位可以多个维度进行重建,空间定位比较好,便于判断眼内异物与眶内结构的关系^[23],对于眼眶DR难以发现的金属异物也能分辨出。同时也能够对球壁前段,晶状体、虹膜后根部、睫状体部的细小的异物进行准确定位。因此,CT三维重建定位法以无创性、分辨率高、扫描速度快、定位准确等优点成为诊断眶部异物理想方法^[24]。

CT三维重建定位法能分辨的球内异物最大径低于眼眶异物DR角膜缝环定位法能分辨的球内异物直径。其原因为随着临床技术的不断进步,临床医生有了玻切技术后,大多数球内中后段异物,即赤道前后及后极部,常能够在显微镜直视下很好取出异物。在晶状体水平面之后的异物,手术方式选择内路方式的情况下,基本上可以在直视下取出,只有在球壁前段,晶状体、虹膜后根部、睫状体部的细小的异物,可选择做缝环定位,算出其钟点位及异物深度,术中才能比较准确地将异物取出。多层螺旋CT具有扫描速度快、分辨频率高的特点,可以快速对眼内的异物进行定位^[25],此时做CT重建定位可以显示异物的情况。同时在手术方式选择外路方式时,也需要做缝环定位来确定异物在眼内或球壁的空间位置,在术中取出,但缝环是对角膜是存在人为损伤。而CT三维重建定位法可以比较准确显示出异物位置,以利于术中取出异物,避免造成人为二次损伤。

本研究结果显示,眼眶异物DR角膜缝环定位法显示异物点钟位、异物到水平面距离、异物到矢状面距离及异物到两侧角巩膜缘连线距离与CT三维重建定位法的结果相比无差异,提示二者对于异物位置显示无明显区别。本研究结果显示,采用CT三维重建定位法比采用DR角膜缝环定位法更清楚地分辨出眼内、外高密度影,其原因为多层螺旋CT平扫联合MPR后处理异物定位法,对眼内、外异物定位比清晰、明确,尤其是眼球壁异物,VRT显影更加有空间定位的意义,过程简单、方便、无直接损伤。

综上所述,对于眼眶内异物定位来说,CT三维重建定位法分辨率高,定位准确,能检测眼球内部细微金属颗粒,可做眼部异物定位的常规方法,同时对于少数在虹膜根部、睫状体部、悬韧带外侧部的小异物定位,需配合眼眶异物DR角膜缝环定位法来定位。

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