

200mA X线机改造摄高电压尘肺胸片与低电压片读片差异的分析

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提 要 对226例用改造后的200 mA X线机所摄高电压胸片与两年内低电压片进行对比, 高电压胸片质量明显提高, 层次丰富, 细微结构清楚, 一级片率由0.4%上升为38.5%, 废片率由6.2%下降到0.4%, 三、四级合计由73.0%下降到12.8%。二者相比原尘肺诊断需改订者占74.8%, 由无尘肺改为I期者最突出, 新检出的79例尘肺中由0⁺中检出者占原0⁺组的90.6%。表明改机后摄片质量明显改善, 影响尘肺诊断, 特别是早期者极为明显。

关键词 尘肺 高电压胸片 X线机

200mA X线机是现阶段我国基层单位尘肺摄片的主要机型, 因射线能量低、穿透差、胸片质量难以保证。改造此型X线机使其最高输出为125kV, 拍摄高电压尘肺胸片, 达到改善胸片技术质量、提高尘肺诊断正确率目的^{〔1〕〔2〕}。本文对接尘工人用改造后的200mA X线机摄高电压胸片并与原机以前所摄低电压片作读片比较, 以评价改机后所摄高电压胸片对尘肺诊断的影响。

1 材料与方法

1.1 设备及改造 原机为上海医疗器械厂1980年产XG200A型诊断X线机, 高压发生器最高输出100kV, 次级瞬间电流200mA, 单项桥式整流。经对高压系统改造及改装, 调整控制电路, 达到高压系统最高输出125kV。

1.2 配件及材料 滤线栅为40线/cm, 10:1, 焦距180cm。中速钨酸钙增感屏, 球管窗外加1mm铝板。手洗套药, 溶配后放置24~48小时后使用。胶片为14×14普通胸片。

1.3 研究对象 本试验高电压摄片总数为1063张, 选择改机前1~2年内有低电压胸片者226人(其中原诊断为0者130人, 0⁺53人, I期40人, II期2人, III期1人), 作高、低电压胸片读片差异研究对象。

1.4 摄片条件 改机前: 60~75kV, 150mA, 12~15mAS, 焦片距180cm, 不用滤线栅。改机后: 120kV, 100mA, 4~8mAS, 焦片距

180cm, 用滤线栅。显影温度前后均为20~24℃, 显影时间3±0.5分钟, 充分定影, 流水冲洗半小时以上, 自然凉干。

1.5 胸片技术质量评判及诊断方式 按《尘肺X线诊断标准及处理原则》的规定评定^{〔3〕}, 并详细记录。诊断由当地尘肺诊断组根据标准规定作出。

2 结果

2.1 两种胸片影像比较 改机后所摄高电压胸片肺野清晰度明显优于低电压胸片, 软组织层次分明, 主气管及分叉可见, 纵膈、心影后结构清晰可辨, 前肋影减少, 肺部细微结构特别是两侧外缘影像清楚, 线形影像边缘锐利。那些低电压胸片上表现为模糊不清的疑似小阴影, 高电压片上则大部分为弧立的、密度高、边缘清楚的阴影, 即使重叠在肺纹理上及肺气肿较明显的区域内也较易辨认, 小部分为纹理交叉或血管的横断面所致。

2.2 改机前后胸片技术质量 改机后所摄高电压尘肺胸片的技术质量明显优于改机前的低电压胸片。改机前的一级片率仅为0.4%, 废片率为6.2% (该矿在摄片当时已将“差片”剔除重照, 不包括在6.2%的废片中), 三、四

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级片合计占73.0%，改机后一级片率提高到38.5%，优良片合计达87.2%，四级片降到1%以下。

前后两次所摄胸片技术质量分级一致的片数共55张，占总数的24.0%；改机前胸片技术质量较改机后质量好的胸片数仅5张，占2.2%；改机后胸片技术质量较改机前提高的片数共165张，占总片数的73.0%，其中有30.5%的胸片技术质量提高二级以上。

改机后胸片质量的提高主要是高电压摄片后曝光条件不当等技术因素得到控制所致。而人为的操作因素如片面划伤、水渍、肩胛骨未拉开等缺陷则未见明显好转。

2.3 改机前后胸片的诊断差异 如下表所示，改机前后所摄胸片诊断结果有较大差异。两次

改机前后诊断结果差异

| 诊断结果 | 改 机 后 | | | | | | | | 合计 |
|-------------|-----------------|----------------|----|----------------|----|-----------------|-----|---|-----|
| | 0 | 0 ⁺ | I | I ⁺ | II | II ⁺ | III | | |
| 改 机 前 | 0 | 38 | 61 | 29 | 2 | | | | 130 |
| | 0 ⁺ | | 5 | 43 | 5 | | | | 53 |
| | I | | | 11 | 14 | 7 | 2 | | 34 |
| | I ⁺ | | | | 2 | 2 | 2 | | 6 |
| | II | | | | | | 1 | | 1 |
| | II ⁺ | | | | | | | 1 | 1 |
| | III | | | | | | | 1 | 1 |
| 合 计 | 38 | 66 | 85 | 23 | 9 | 3 | 2 | | 226 |

诊断完全一致的只有57张，占总数的25.2%，改机后诊断分布有明显的从中心斜线向右偏移倾向，即高电压胸片较改机前低电压胸片诊断级别增高的例数明显增多，计167例，占73.9%。新检出尘肺患者79例，占原无尘肺183人中的43.2%，I期以上患者数从原有的43例上升到122例，从全组226例比重19.0%上升到50.0%。

在本期范围内变动者76例（包括0到0⁺61例，I期变为I⁺者14例，II期变II⁺者1例），比率为33.6%。变动跨期即从无尘肺改变为I期尘肺，I、II期尘肺分别变为II、III期尘肺者91例，占40.3%；其中差异大即变动两个方格的有45例，占19.9%。

上述诊断变动的原因都是因改机后的胸片

清晰度增加，小阴影确切辨认的把握增大所致。也有两张胸片原为I⁺，低电压胸片曝光不足，小阴影量似较多，改机后的高电压胸片影像清晰，小阴影数量明显减少，诊断改为I期。

3 讨论

3.1 胸片技术质量差是尘肺诊断中误诊、漏诊及读片差异大、重复性差的原因之一^{〔5〕}。目前我国基层单位尘肺检查所用的X线机多为国产200mA X线机，所摄胸片对比度高、层次少、骨骼及软组织影对肺内结构的显示有严重影响^{〔6〕}。同时由于低电压胸片所用X线能量低，穿透性差，使X线胶片感光的光子量极易受被检查个体的影响，难以控制，是出废片的基础，故基层所摄胸片废片率在30%以上。为克服基层单位不能更新设备的困难，采用了改机的办法使200mA X线机达到能摄高电压片的要求，经现场试验改机后所摄高电压胸片确实表现好：对比度适中，层次丰富，肋骨、胸大肌等肺周组织的遮盖作用轻，肺部细微结构显示清晰^{〔7〕}，废片量大大减少，优良片率大幅度上升。

3.2 提高尘肺诊断质量是提高胸片质量的主要目的。改机前后所摄胸片的尘肺诊断读片差异可能有三方面原因：（1）病变发展；（2）读片差异，读片有差异是允许的，其一致性在60~80%之间^{〔4〕}；（3）前后两次胸片技术质量不同，对病变的显示不同使诊断有差异。

本文试验所选对象226例改机前后所摄胸片时间相差1~2年左右，该矿尘肺最短发病工龄为5~6年，进展缓慢，两年时间病情发展对诊断差异的影响较小，如此重大的读片差异不能用病情的自然发展来解释。从表中看出，读片差异有明显中心斜线右移倾向，即向阳性方向偏移，与读片标准不稳定、在某个诊断点上下波动的差异不同，表示差异原因来自外界系统影响，即胸片技术质量对诊断发生了影响，但影响这么大，75%的试验样本改订了诊断，则十分引人注目，尤其是早期患者。

3.3 改机前后所摄胸片对比，一级片率明显上

升,废片率下降到1%以下。分析原因发现改机前三、四级较多主要与曝光条件掌握不当有关,改机后胶片对高能射线的宽容度大,曝光条件调整幅度小,一般不存在曝光条件选择不当的问题。因此,由曝光条件选择不当而产生的三、四级片数大大减少,改机后用14×14胶片,因体位不正所致的缺陷亦明显减少。但因基层单位平时缺乏良好的质控措施,工作求快多不求细,不严格掌握评片标准,致使片面划伤、水渍、肩胛骨未闪出肺野等操作因素所致缺陷片减少不显著。如能严格要求,加强培训则胸片质量还有提高潜力。

4 参考文献

- 1 孙承业,等.高、低电压胸部摄影技术质量对比研究.中华劳动卫生职业病杂志

- 2 孙承业,丁茂柏.高低电压胸片尘肺细微结构显示量的研究.中国公共卫生学报
- 3 GB《尘肺X线诊断标准及处理原则》(GB5906-86).北京:标准出版社 1986.
- 4 丁茂柏,等.《1986尘肺诊断标准》读片重复性研究.中国工业医学杂志 1988;1:2
- 5 Tuddenham WJ.High kV chest radiography Proceeding of optimizational chest radiography. 1980; 47HHs Publ (FDA); 80
- 6 孙承业,等.胸片上各解剖结构相对遮盖面测定的研究.中国工业医学杂志 1992;5(3):137
- 7 孙承业,丁茂柏.高电压胸部摄影在尘肺诊断中的应用.国外医学(卫生学分册) 1991;10:197
- 8 丁茂柏.尘肺综合诊断指标的研究.中国工业医学杂志 1991;4(2):8
- 9 丁茂柏,等.应用国产X线机摄高电压尘肺胸片的研究.中国工业医学杂志 1990;3(3):1

矽肺结核强力化疗中发生迟发性“类赫氏反应”1例报告

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王某,男,67岁,风钻工,有矽尘接触史9年。因反复咳嗽、咳痰20余年,加重半年伴左颈部肿块1月余入院。有肺结核病史20年,曾用雷米封(INH)、链霉素(SM)及对氨水杨酸钠治疗10个月。入院时查体:左锁骨上触及一枚肿大淋巴结,大小约3×4cm,质软,无压痛,左肺呼吸音稍低,痰查抗酸杆菌(-),ESR34mm/h,X线除Ⅰ期矽肺表现外,两上肺可见斑片状密度增高阴影,边缘模糊。诊断Ⅰ期矽肺合并肺结核,进展期;左锁骨上淋巴结结核。给予INH、利福平(RFP)、乙胺丁醇(EMB)及SM强化抗痨。两个月后改用INH、RFP、EMB方案,治疗3个月,临床症状好转,ESR降至1mm/h。但6个月后咳嗽又加重,咳白色泡沫痰,伴午后发热。T38℃左右。血象WBC $4.4 \times 10^9/L$,P0.66,L0.34,ESR70mm/h。痰普通菌培养(-),痰查抗酸杆菌6次(-)。X线示右肺门增大,继续原方案抗痨,同时抗炎治疗。先后使用过洁霉素、青霉素加庆大霉素及氨苄青霉素等抗生素,但症状无好转,X线示病灶反而继续增大,呈团块状,直径3.5×5cm,与右肺门相连,侧位片位于尖后段。查痰脱落细胞6次均(-)。以后继续原方案治疗,停用抗生素,至第9个月症状好转,体温正常,X线示病灶吸收好转。第10个月左锁骨上肿大淋巴结不能触及,X线示病灶明显吸收好转,

ESR4mm/h。

讨论

所谓“类赫氏反应”是指在结核病强化治疗中,尤其是疗程初期阶段出现暂时性临床表现和X线病灶恶化,而在继续原方案治疗中病情好转或治愈的现象,类似于“驱梅治疗中的赫氏反应”。其发生机制大多认为系杀菌药物在短期内杀死大量结核杆菌,使大量死亡的结核菌的菌体蛋白、磷脂等在短期内入血,引起全身特别是肺及淋巴结产生的一种变态反应。该患为复治矽肺结核,临床有呼吸道症状加重,X线有典型结核表现,加上血沉增速支持结核活动。在抗痨治疗后症状一度好转,血沉降至正常。但6个月后症状再次加重,而临床无炎症征象,且抗炎治疗无效,并排除肺肿瘤。继续原方案治疗,临床症状和X线表现均明显好转,故符合强化治疗中发生的“类赫氏反应”。据文献报道,此反应在单纯肺结核中的发生率一般为3.6~5.6%,并且大多数发生在治疗开始的3个月内。我院自1977年以来,用含RFP方案治疗的住院矽肺结核86例,仅发生1例(1.2%),发生率低于单纯肺结核。推测可能与矽肺结核的免疫功能减退有关。至于本例延迟到6个月后才发生反应亦不多见,表明本反应亦可在治疗后6个月甚至更长时间后发生,不可轻易判断治疗无效而改变治疗方案。

Abstracts of Original Articles

Investigation on the Reproductive Effects in Female Workers Exposed to Manganese

Yu Huizhu, et al

The study showed that the incidence of distending pain of the breast, somnolence, insomnia, fatigue at premenorrhea phase were significantly higher in female workers exposed to manganese than those in non-exposed workers. When exposed level was $<0.4 \text{ mg/m}^3$, the incidences of menostaxis or infrequent menstruation became significantly higher in the exposed group than those in the control group, when incidences of irregular menstruation, infrequent menstruation, menostaxis and dysmenorrhea were significantly higher in the exposed group than those in the control group, and definite exposure-response relationship was revealed. There were no differences between the exposed group and the control group in birth defects, death, asphyxia and lowbirth weight in new-borns, and also no differences in intelligence, growth and development in children, but the incidence of birth defects of the offsprings from exposed females was higher than that of national average birth defects (13%), RR was 2.6.

Key words: menstruation, reproductive outcome, exposure-response relationship

Study of Allowable Limit of Occupational Exposure to Quartz in Respirable Dust

Li Ke, et al

we have selected eight large tungsten mines and used the methods of restrospective cohort study. By means of logistic regression, the results showed that the exposure limit of quartz in respirable dust is $245 \mu\text{g/m}^3$ if the

probability of pneumoconiosis for the 30 years length of exposure. In the author's opinion, the exposure limit is $70 \mu\text{g/m}^3$ if no pneumoconiosis will occur in a period of 30 years of exposure.

Key words: respirable silica, pneumoconiosis, exposure limit

A Pathological Study on Pneumoconiosis Caused by Raw Cement Dusts

Zhang Xuqin, et al

Five autopsized cases which only exposed to raw cement material dusts were reported in this paper. Their characteristics of pathologic changes concerned with dusts in the lungs are as follows: (1) numerous dust fibrosis foci and focal emphysema are formed in parenchyma of the lungs, (2) there are "cement bodies" in dust fibrosis focal, (3) mixed dust nodules are formed in the lungs of part cases, (4) there are chronic bronchitis and slight pulmonary fibrosis. By means of EDXA, SEM, EDXA-SEM and X-ray diffraction, the elements of the dust foci, the nodules were detected. The nodules in lung tissue were observed, the results showed that the elements of intrapulmonary dusts are similar to the environmental raw cement dusts. Therefore, we considered that the pathologic changes in the lungs are caused by the raw cement material dusts.

Key words: cement, raw material, cement body, macule

Analysis of The Reading Deviation between High kV Chest films Taken by 200mA X-ray Generator Reformed and Old ones

Ha Kuanting, et al

Reading deviations between high kV chest films of 226 coal workers taken by

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| Analysis of the reading deviation between high kV chest films taken by 200mA X-ray generator reformed and old ones Ha Kuanting, et al..... | (75) |
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200mA X-ray generator reformed and the old ones taken within recurt a years were studied. Film quality was significantly improved. A high out put of grade excellent 38.5%, had been obtained, and films unreadable had been significantly decreased. The rate of the third and the fourth grade as a whole had been reduced from 73.0% to 12.8%. Classification of pneumoconiosis was changed in 169 newfilms. 79 cases 90.6% of the former 0+ group were classified as stage "I" pneumoconiosis. It is shown that, generator reformed, classification favoured.

Key words: high kV chest films, Classification of pneumoconiosis, 200mA X-ray generator.

Activity of Antilipidperoxide in the Blood of People Working in Silicious Dust

Ma Yong

The activities of superoxide dismutase

(SOD) and glutathione peroxidase (GSH-Px) were measured in the blood of workers exposed to silicious dust. The results showed that the values of the activities of SOD, GSH-Px were 2.396 ± 0.413 (10^3 U/gHb) and 35.06 ± 6.94 (μmol GSH oxidized/min.gHb) respectively. These were significantly higher than that of controls with 2.098 ± 0.591 (10^3 U/gHb) of SOD and 27.41 ± 9.20 (μmol GSH oxidized/min.gHb), and the activities of SOD, GSH-Px in the long dust exposing group were also significantly higher than that of the short period of dust-exposing group. It indicated that the activities of lipidperoxide and antilipidperoxide were both in active status in the people exposing to silicious dust for long time. The increase of the latter may be a defensive mechanism of the body, a response to the cytotoxicity of SiO_2 in different phases.

Key words: silicious dust, superoxide dismutase (SOD), glutathione peroxidase (GSH-Px)