

How to Erase Scribbles on X-ray Films

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<국문초록>

X선필름상의 표지 및 낙서제거법*

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학술정보 교환 또는 강의에 사용되는 각종 표, 그림, X선사진 등은 모두 깨끗하게 제작되어야 한다. 이 중 특히 X선필름은 많은 사람이 보고 만지기 때문에 훼손되기 쉬우며 또 여러가지 필기 도구로 화살표시나 글씨 또는 숫자를 써넣은 것을 그대로 슬라이드나 사진으로 제작을 할 수 없을 때가 많다. 이에 저자들은 X선필름에 기입되어 있는 여러가지 기호, 글씨 또는 필름위에 부착된 lettering을 깨끗하게 지우는 방법을 찾아내기 위해 일련의 실험을 하였다.

저자들의 실험 결과를 보면 연필, 볼펜, 색연필 그리고 유성 싸인펜으로 쓴 글씨나 낙서는 물과 보릭 그리고 알코홀, 아세톤, 자일렌, 휘발유, 신나 등의 유기용매 그리고 고무지우개로 쉽게 제거가 되었다. 매직잉크는 알코홀, 아세톤, 자일렌, 신나 등으로 잘 지워졌으며 필름위에 붙여진 레터링도 아세톤과 몰파스 액으로 잘 지워졌다.

한편, 수성 싸인펜 글씨만은 표백제(유한락스) 외에 다른 어느 물질로도 깨끗이 지워지지 않았다. 표백제의 수성 싸인펜 글씨 제거효과는 원액을 20 배~30 배로 희석하였을 때 가장 좋았으며, 희석 배수가 이 범위 이하이거나 이상일 때에는 각각 필름막면까지 녹아서 벗겨지거나 잘 지워지지 않고 글씨나 숫자가 희미하게 남게 되거나 하였다.

전체적으로 평가하여 보면, 필름위의 표지 및 낙서가 연필, 볼펜, 색연필, 유성 싸인펜, 매직펜, 또는 레터링에 의한 것일 경우에는 몰파스가, 수성 싸인펜에 의한 것일 경우에는 20 배~30 배로 희석한 유한락스액이 가장 효과적임을 알았다.

Water, alcohol, boric acid, oil paint thinner, acetone, xylene, gum eraser, gasolin, Moolpas®* and various dilutions of Yuhanrax®** were tested for removing marks made with pencil, colored wax pencil, water-base felt-tip pen, oil-base felt-tip pen, magic

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* Topical solution containing L-menthol (4,200 mg), Camphor, (4,500mg), Methyl salicylate (6,900mg), Thymol (300mg), Chlorpheniramine maleate (100mg), Vanillyl nonoylamide (10mg), Compound ethanol (80ml), Glycerine (q.s) and Water (q.s). For further information, please contact Hyun Dae Pharmaceuticals, Seoul, Korea

** Laundry bleach detergent containing 4.0% NaClO minimum.

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marker and lettering using letter sticker on X-ray films. Of the agents used, acetone and Mollpas® proved to be the best agents for removing marks made with pencil, ball-point pen, colored wax pencil, oil-base felt-tip pen and lettering. For marks made with water-base felt-tip pen, Yuhanrax® diluted 1:20-1:30 with water was the only effective agent.

Every slide or figure used in a presentation or a publications should be accurate, appropriate, legible and comprehensible. To make high quality slides or figures, the original X-ray film should not only be well processed but also well preserved; however, the films occasionally are abused by not only the radiologists but also by referring physicians, nurses and radiotechnicians who label letters or use various agents to mark the films. Unfortunately, some of these marks are difficult to remove and appear on the slides and figures used in some presentations and publications. This study was conducted to find the most effective method to remove the marks made with the various agents.

Materials and Methods

New X-ray films were exposed and

developed by standard methods. Each developed film was marked with pencil, ball-point pen, colored wax pencil, water-base felt-tip pen, oil-base felt-tip pen, magic maker and lettering using letter sticker then permitted to dry completely. After verifying that all the marks had dried, each film was wiped with successive gauze dipped in either water, alcohol, acetone, xylene, boric acid, oil paint thinner, gasoline or Moolpas® and gum eraser. Old X-ray films that had been marked were retrieved and wiped with successive gauze and gum eraser in the same manner as was done with the new films. The effect of the various agents on removing the marks was classified from poor to excellent using the scale shown on Table 1. For marks that were not removed by the mentioned agents satisfactorily, serially diluted solutions of Yuhanrax® was used to attempt removal.

Table 1. Effect on Removing Marks

Poor	-	damage to the roentgenographic image
None	o	no effect
Mild	+	incomplete removal after 10 scrubs
Good	++	complete removal after 5-7 scrubs
Excellent	+++	complete removal after one scrub

Table 2. Effect of Various Erasing Agents on Scribbles

Erasing Agents	Writing Agents	Ball-point pen		Felt-tip pen		Magic marker	Lettering using letter sticker	
		Pencil	War pencil	Aqueous	Oily			
Water		++	++	++	+	++	+	o
Boric acid sol		++	+++	++	+	++	+	o
Alcohol		++	++	++	+ / ++	++	++	o
Acetone		++	++	+++	+	+++	+++	+++
Moolpas®		+++	+++	+++	+	+++	+++	+++
Gum Eraser		++	++	++	+	++	++	o
Xylene		+++	++	+++	o	+++	+++	o
Gasoline		++	++	+++	o	++	++	o
Oil paint thinner		+++	+++	++	+++	+++	+++	o
Yuhanrax®(1:20-1:30)		+++	+++	++	+++	+++	+++	o

Table 3. Effect of Various Concentrations of Yuhanrax® on Removing Marks

Dilution (ration)	2	5	10	15	20	30	35	40	45	50
Effect	–	–	–	–/++++	+++	+++	+++ / ++	++	++	+

Results

A summary of the effect of the agents tested X-ray films to remove marks made by the various writing utensils is given in Table 2. Marks made with pencil, ball-point pen, colored wax pencil and oil-base felt-tip pen were removed easily with any of the agents tested. Marks made with majic marker were effectively removed with alcohol, acetone, Moolpas®, gum eraser, xylene, gasoline and oil paint thinner. Lettering using letter sticker on X-ray films were easily removed with acetone and Moolpas®. However, of the above mentioned agents, only alcohol showed mild to good effect on marks made by water-base felt-tip pen.

Yuhanrax® showed a spectrum of effects on marks made with water-base felt-tip pen from poor to excellent with varying dilutions (Table 3). At less than 1:15 dilution, Yuhanrax® was effective in removing the marks but also caused damage to the X-ray film image. Above 1:35 dilution, the film image was preserved but the marks were not well removed. Best effect was seen at 1:20-1:30 dilutions where the marks were easily removed while the X-ray film image was preserved.

Old and new X-ray films in comparison showed nearly identical response to the tested agents with the old films requiring slightly more effort to remove the marks than the new films.

Discussion

Every publication or presentation requires clear content but clear figures and slides should also be used. Unlike tables and diagrams that may be clearly produced, X-ray films are subject to many possible obstacles, some of which can be corrected and some of which cannot be corrected. For example, films which are over-exposed can be reproduced to better suit publication(1) while artifacts caused by improper and careless developing or handling cannot be remedied. More often, the marks made by radiotechnicians, radiologists, nurses and referring physicians though they may aid in elucidating the abnormalities and problems at that moment damage and may distract or obstruct future use of the film. To obviate the problems caused by these marks on X-ray films, an inexpensive, easy to use, readily available, rapidly effective agent is needed to remove the marks.

In conclusion, the results of this study show that although many agents are available, acetone and Moolpas® are most effective in removing marks made by most utensils used on X-ray films except water-base felt-tip pen which is effectively removed with 1:20-1:30 diluted Yuhanrax®.

REFERENCES

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