Ge-conservación
Conservação | Conservation

5ᵀᴴ EDITION OF THE INTERNATIONAL MEETING ON RETOUCHING OF CULTURAL HERITAGE

RECH5
Urbino, Italy

UNIVERSITÀ DEGLI STUDI DI URBINO "CARLO BO"
SCUOLA DI CONSERVAZIONE E RESTAURO DEI BENI CULTURALI

18ᵀᴴ - 19ᵀᴴ OCTOBER
2019

The use of a virtual image as a step to the aesthetic presentation of an overpainted baroque painting

Ana Sterle, Lucija Močnik Ramovš

Abstract: Technology has become an important part of the conservator's work, and we are still learning how to fully embrace it for a better practice. The main problem is lack of time for the treatment of cultural heritage and not enough knowledge in the field of technology. In this article we introduce the use of a virtual image to assist with the restoration of the painting *Mater Dolorosa* by a famous Slovene baroque painter Marko Layer. The painting's complex conservation state indicated a need for a different approach when implementing procedures. Graphical documentation of the areas that needed to be removed and reintegrated was made for a transparent view of the upcoming work. To help with the removal and the reintegration process, a virtual image of the reintegrated painting and its options was made. The purpose was to get to know the painting's specifications better. During the making of the virtual image, the painting was researched in detail in order to correctly apply the theory to practice.

Keywords: conservation, chromatic reintegration, baroque painting, overpaint, virtual restoration, aesthetic presentation

El uso de una imagen virtual como paso para la presentación estética de una pintura barroca sobrepintada

Resumen: La tecnología se ha convertido en una parte importante del trabajo del conservador, y todavía estamos aprendiendo cómo usarla en su totalidad para las mejores prácticas. El principal problema es la falta de tiempo para el tratamiento del patrimonio cultural y el conocimiento insuficiente en el campo de la tecnología. En este artículo, presentamos el uso de una imagen virtual como ayuda para restaurar la pintura *Mater Dolorosa* del famoso pintor barroco esloveno Marko Layer. El complejo estado de conservación de la pintura indica la necesidad de un enfoque diferente al implementar los procedimientos. La documentación gráfica de las áreas que debían eliminarse y reintegrarse se realizó para que fuera posible tener una visión transparente del trabajo que siguió. Para ayudar con la eliminación y el proceso de reintegración, se hizo una imagen virtual de la pintura reintegrada con sus opciones. El objetivo fue comprender mejor las especificaciones de la pintura. Durante la ejecución de la imagen virtual, la pintura se investigó en detalle para aplicar correctamente la teoría a la práctica.

Palabras clave: conservación, reintegración cromática, pintura barroca, repintar, restauración virtual, presentación estética

O uso de uma imagem virtual como passo para a apresentação estética de uma pintura barroca repintada

Resumo: A tecnologia tornou-se uma parte importante do trabalho do conservador, e ainda estamos a aprender a utilizá-la na sua totalidade para uma melhor prática. O principal problema é a falta de tempo para o tratamento do património cultural e o insuficiente conhecimento no campo da tecnologia. Neste artigo, apresentamos o uso de uma imagem virtual como meio de auxílio no restauro da pintura *Mater Dolorosa* de um famoso pintor barroco esloveno Marko Layer. O complexo estado de conservação da pintura indicava a necessidade de uma abordagem diferente ao implementar os procedimentos. A documentação gráfica das áreas que precisavam de ser removidas e reintegradas foi feita para que se conseguisse ter uma visão transparente do trabalho que se seguia. Para ajudar na remoção e no processo de reintegração, foi feita uma imagem virtual da pintura reintegrada com as suas opções. O objetivo foi conhecer melhor as especificações da pintura. Durante a execução da imagem virtual, a pintura foi pesquisada em detalhe para aplicar corretamente a teoria à prática.

Palavras-chave: conservação, reintegração cromática, pintura barroca, repinte, restauro virtual, apresentação estética

Introduction

In today's digital and media age, conservators are striving to introduce more modern approaches to preserving and restoring cultural heritage. These include all processes involving science, whether from the field of chemistry, physics, or technology that provides more insight into artwork (Buzzanca 2000: 148).

The popularity and growing interest in virtual restoration has escalated since 1980 with the development of image processing programs and by raising awareness about minimal interference with an artwork (Saunders *et al.* 2006: 521).

—*Baroque painting Mater Dolorosa*

The baroque painting *Mater Dolorosa* by Marko Layer (1727–1808) is a great example of implementing virtual restoration for conservation proposal.

It is painted in oil-egg tempera on linen canvas with the number of threads: weft 9 and warp 8. The preparatory layer is coloured and applied in two layers. On most areas the original paint was applied in multiple layers except for the background where there is only one original layer of dark colour. The cross-section microscopy analysis showed remnants of the original varnish which suggested that it had been removed before the application of the overpaint.

The said overpaint was the main concern of the painting and profession commission agreed it should be selectively removed. Flesh tone areas were confirmed by a cross-section of paint layers to be an original. The background was decided to be retained because of the similarities in tone and texture with the original; furthermore, removal tests on the background showed uneven paint layer so the procedure was deemed too risky. Everything else was overpainted and was to be removed. The painting was subjected to conservation treatments multiple times with different groups of professionals working on it. During previous procedures that were carried out from 2011 to 2016, a good portion of the overpaint was successfully removed by stearic emulsion with 5 % of ammonium hydroxide combined with a mechanical approach; the emulsion was applied through the lens tissue on the surface until it softened the overpaint. The removal process was then continued mechanically using a scalpel with a smaller blade under the lens. The emulsion was prepared with 500 g of beeswax in 750 ml of distilled water with 12 ml of ammonium hydroxide mixed with 1, 2 g stearic acid. (Ambrožič 2013).

In 2018 the overpaint remained only in the sensitive areas of the original paint layer [Figure 1]. The initial goal was to finish the procedures; removal of the overpaint and chromatic reintegration. Since the painting was in a complex state, it was important to thoroughly document the condition and to propose the final treatments. The main methods were graphic documentation and a virtual image for the intended preview of the artwork (Sterle 2019: 33–37).

Figure 1.- Marko Layer, *Mater Dolorosa*, 18th century, 68 × 48 cm, oil-egg tempera on canvas, National Gallery of Slovenia. (a) Condition of the painting in 2011 and (b) 2018 (© University of Ljubljana, Academy of Fine Arts and Design).

Graphic documentation

In today's technology-driven world, digitally created graphic documentation is a staple as a conservator's way of documenting cultural heritage. It is a very efficient method to transparently display the image of an artwork, its condition, treatment proposal, time management of completing treatments, etc. (Moore 2001).

After examining the details of the painting's condition, we created graphic documentation, showing the condition, the existing overpaint, and the planned procedures of the removal of the overpaint and chromatic reintegration. [Figure 2].

The artwork was in a complex state; overpaint was partially removed, and other conservation-restoration procedures were mostly temporary, so we had to extensively investigate before the intervention in 2018.

With the help of the graphic documentation we calculated the time it will take us to remove the overpaint. We measured the time of removing a square centimetre of the overpaint. Then we multiplied the obtained result with the size of the entire area where the overpaint will be removed. This gives a valuable estimation of the timing and helps with the organisation of the work.

Virtual restoration

Virtual restoration of cultural objects is considered a possible way of documenting or displaying visual results from research (Stols-Witlox 2012: 180). Most of the time virtual images are created because of the difficulties in aesthetically presenting the cultural heritage itself, whether for ethical, financial or other reasons. It plays an important part in presenting cultural heritage to the general public as it enhances the work and makes it interesting (Limoncelli *et al.* 2017: 1–3).

On the other hand, the standards are moving towards implementing virtual restoration for a proposal of conservation procedures as well as presenting the proposed treatment to the curators for better decision making.

—*Purpose and goals*

In previous interventions that took place from 2011-2016, most of the overpaint was removed, revealing a completely different shape of the draperies and the sword. The overpaint remained on the sensitive area of the red garment, raising the question, what the red garment under the blue drapery looked like.

Legend:

▨ Chromatic reintegration ⠿ Removal of the overpaint
▧ Holes ▧ Tear ▥ Present overpaint

Figure 2.- (a) Graphic documentation of the proposed treatment in 2018; removal of the overpaint and chromatic reintegration and (b) condition of the painting in 2018; present overpaint, tear and holes (© University of Ljubljana, Academy of Fine Arts and Design, created by Ana Sterle).

The process of a virtual restoration helped us with:
- collecting visual information,
- understanding the painter's technology,
- better performance of conservation procedures,
- avoiding mistakes.

The purpose of *Mater Dolorosa's* virtual image, which shows the result of a conserved-restored painting, was primarily to prepare for work by collecting visual information.

By studying a cross-section of paint layers, RTG photograph and the surface of the painting, we determined which layer is original. This was crucial to avoid over-removal of the original paint layer which had occurred in the past with the same painting. It also helped with choosing the chromatic reintegration as the most appropriate method for the aesthetic presentation.

Virtual restoration is a process that could not be undertaken without thorough examination and documentation of all findings. It helped to understand the process of how the painter applied colour – with pastose brushstrokes which created a lined texture that the unwanted coating hid. This knowledge was crucial for the successful removal of the unwanted layer.

—*Graphic software*

Many graphic software programs are available for image manipulation and implementing the virtual restoration. When it comes to choosing, there are many factors to be considered:
- user-friendliness,
- 3D or 2D artwork,
- resolution (vector or raster),

- other available features, such as photogrammetry, mapping, animation, etc.

For simple handling and manipulation of 2D artworks, raster graphic software programs, such as GIMP (free, open sourced software) or Adobe® Photoshop® software (commercial software) are commonly used in conservation, especially when we are editing with pixels. On the other hand, for 3D special effects, photogrammetry, mapping, etc. we use (usually vector) graphic software programs such as Blender® (free, open sourced software), Adobe® Illustrator® software (commercial software), etc. (Batiha *et al.* 2007).

When implementing virtual restoration on *Mater Dolorosa*, we used Adobe® Photoshop® software because it offers tools anyone can easily handle with little knowledge. Therefore, we were able to manipulate the image in a very short period, which is important since there is usually little to no time for the side projects in our profession.

— *Analysis techniques*

Our virtual restoration was based on several techniques. The main source of information were non-destructive techniques, i. e. X-ray photograph and infrared photograph (IR). Cross-sections of the picture layer were also used.

The original painting is most visible in the X-ray photograph [Figure 3-a]. We were lucky the artist used lead white to lighten colours, which resulted in a rather detailed image of the original draperies, the sword and a headscarf that was not as visible on other photography sources. On the other hand, the IR photograph [Figure 3-b] revealed information about the dark areas of the original painting,

Figure 3.- a) X-radiography of the painting and (b) IR photograph of the painting (© ZVKDS RC, photo: Katja Kavkler; University of Ljubljana, Academy of Fine Arts and Design).
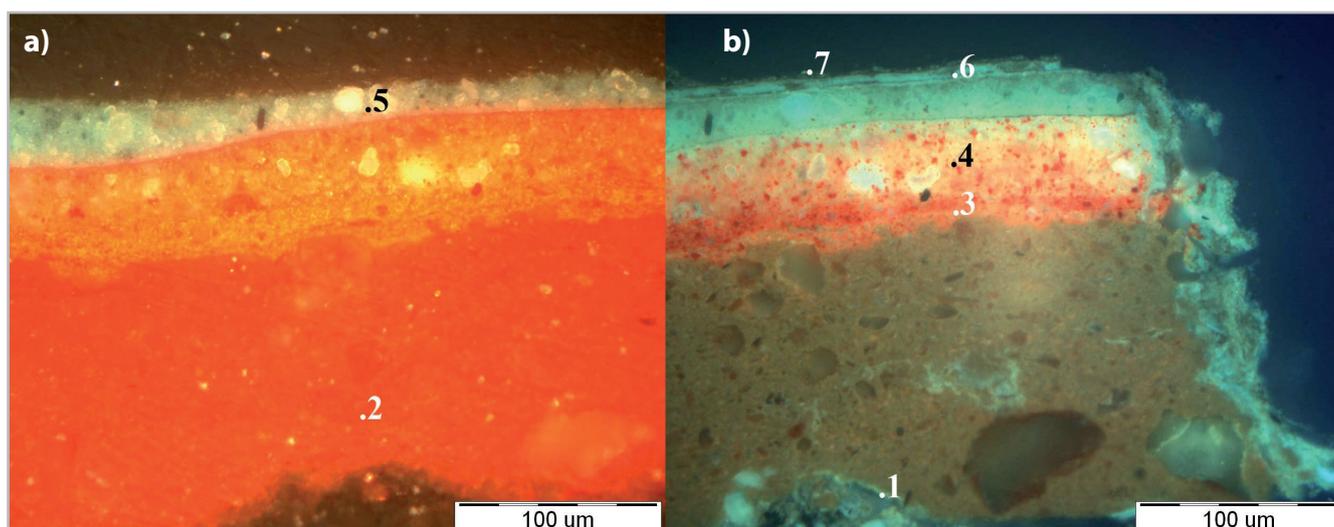
Figure 4.- Cross-section microscopy analysis of the sample collected near the tear. (a) image in visible light and (b) under ultraviolet light. Layers 4 and beneath are allegedly original. 1 – isolation layer, animal glue; 2 – ground layer; 3 – red; 4 – red; 5 – blue; 6 – varnish; 7 – blue glaze. This sample of cross-section was most relevant for the intervention in 2018, however, other samples of cross-section showed remnants of varnish between the original and the overpainted layers. (© ZVKDS RC, photo: Katja Kavkler).

where pigments contained carbon (Macbeth 2012: 297). Both imaging methods combined resulted in a fully modelled original painting, which inspired us in the first place to create the virtual image of the primal look.

The cross-section [Figure 4] of the picture layer was a good overall indicator of the overpaint and the original colours, as the remnants of the original varnish, the overpaint and multiple coats of the later finishing varnish are detectable (Kavkler *et al.* 2012). The problem using this source during the conservation procedures is the lack of information on the original colours in ambiguous areas since information is restricted to a small area, it is impossible to determine what colour was originally a few centimetres away. That is why in our case, the X-ray photograph was the dominant source of visual information.

—*Virtual modelling of the red drapery*

As mentioned before, we were working with a 2D digital image with the goal of creating a digitally manipulated image of the painting in its ideal state, displaying the effects of the ravages of time. Lacunas and other damages on the painting's surface were aimed to be systematically and thoughtfully reintegrated while considering ethical principles. That was important since the purpose was to implement the information gained from research to the actual painting. The process was so complex because we were dealing with a heavily damaged painting and with a removal of the overpaint that already compromises between removing or retaining the overpaint.

The virtual image was digitally manipulated with an Adobe® Photoshop® software. The procedure [Figure 5]

was completed in a short span of a time and it required only basic prior knowledge.

The area of the remaining overpaint was covered with a base paint colour – red. The paint was then texturized with the Clone Stamp Tool, which is a well-known tool in conservation. Information from the X-ray photograph was then copied and adapted to the prepared area. The copy's transparency was lowered to forty per cent for better adaptation. The X-ray copy needed to be lighter, so we painted it with a brush in white, choosing the Soft light filter. Using the same procedure, we adapted the information from the IR photograph [Figure 5 – (d)].

Chromatic reintegration was partially completed when reintegrating support damages while there are other techniques; using saved textures or textured brush and applying multiple colours to the wanted area, previously selected with a Magic Wand Tool. With semi-automatic software that offers this procedure automatically and with the known conservation reintegration methods such as neutral tone, chromatic selection or chromatic abstraction, *tratteggio* (Barni *et al.* 2000), the process would seem easier, but we would consequently pay less attention to the painting's features.

We finished the process by saturating colours on a scale to imitate a varnish.

Results contributed in a realistically looking red drapery, and by following the same steps, virtual restoration of the painting would be possible even if the overpaint on other areas had not been removed yet. In this case, preliminary tests would have to be made to acquire the true colours of the revealed areas and the resulted modelling would be most likely exaggerated.
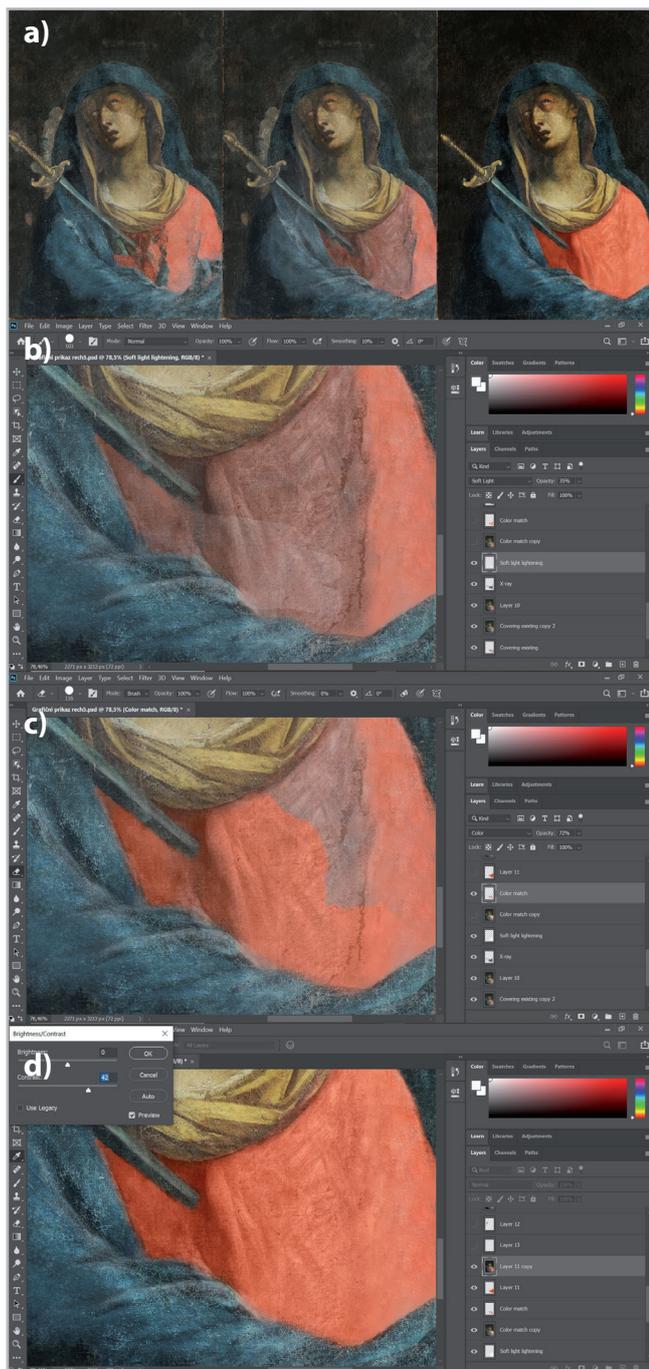
Figure 5.- Process of digital manipulation. (a) Condition before the digital manipulation; adaptation of X-ray photograph to the wanted area; image after chromatic reintegration and saturation of colours; (b) application of information from the X-ray photograph and the process of lightening; (c) application of colour to the grey area; (d) reintegration of damages and saturation of colours (© University of Ljubljana, Academy of Fine Arts and Design).

Chromatic reintegration on the actual painting

Mater Dolorosa was an example of a painting with a variety of irregularities in the paint layer: patina wear, lacunas, over-removed paint layer, cracks and present overpaint. We approached them with different methods.

Where the ground layer was missing, we applied a compatible filling, consisting of animal glue, chalk and a few drops of linseed oil. Gouache colours were applied in lighter and cooler tones in preparation for finishing retouching, and then isolated with an intermediate varnish Laropal A81 in Shellsol A. Chromatic reintegration was implemented with two main methods; application of vertical lines and dot application; for smaller and uncomplicated gaps we opted for mimetic method.

Wear of the glaze is present throughout the flesh tone area, which we have decided to preserve since the cross-section of picture layer confirmed the area was not overpainted. More problematic area was in the top right corner, where the wear was more extensive and aesthetically disturbing. In this particular area, the final toning layer has a prominent striped texture, which is why we reintegrated the area by continuing these stripe patterns. The lines are thinner so that the retouch is brighter and recognizable, but not aesthetically disturbing. Because the chromatic reintegration was implemented on the original colour layer, good documentation was crucial [Figure 6 – (a, b)].

Over-removed paint layer was present in several areas, including areas of the preliminary testing. Where the artist's brush strokes were not pronounced, we reintegrated with the application of dots and where the artist's brush strokes created a line texture, we used a derivative of the "*tratteggio*" method with lines in a customized direction.

The present overpaint was problematic only in two areas: a light blue colour and a sword residue on the background. The approach required good documentation and covering of the overpaint. We used the dot method.

The lower part of the red garment ended ambiguously with the continuation of the blue drapery beneath the red coloured layer. Both paint layers are original, which is why we have carefully documented the chromatic reintegration process. Digital simulation helped us solve the case. The retouching was done by allowing the blue paint layer to pass/transpire through the dotted method [Figure 6 – (c, d)].

Gouache was applied with Lefranc & Bourgeois Linel Artists' Gouache, commercial highly pigmented colours based on arabic gum.

Chromatic reintegration was performed with the Gamblin Conservation Colors based on a stable aldehyde resin, which remains soluble over time with less polar solvents, with a high refractive index, reaching saturated colours like with oil paints. The product is characterized by light-resistant pigments and is easy to use. (René de la Rie *et al.* 2000: 55)
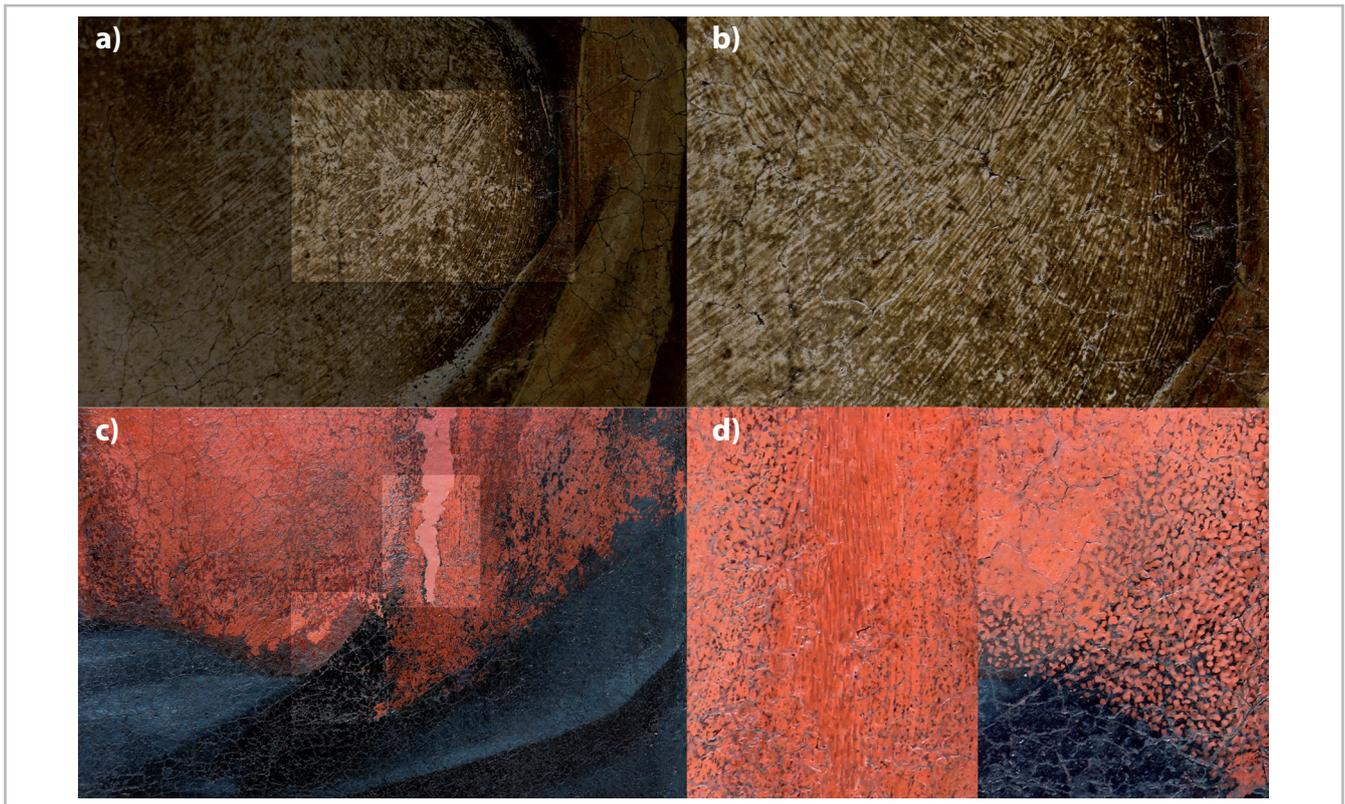
Figure 6.- (a) Detail of the flesh tone area with the apparent wear of the glaze; detail before the chromatic reintegration; (b) close up of the implemented chromatic reintegration on the highlighted detail; (c) detail of the ambiguous draperies area; (d) close up of the detail after implemented "tratteggio" method on the tear; close up of the chromatic reintegration with the dot method. (© University of Ljubljana, Academy of Fine Arts and Design).
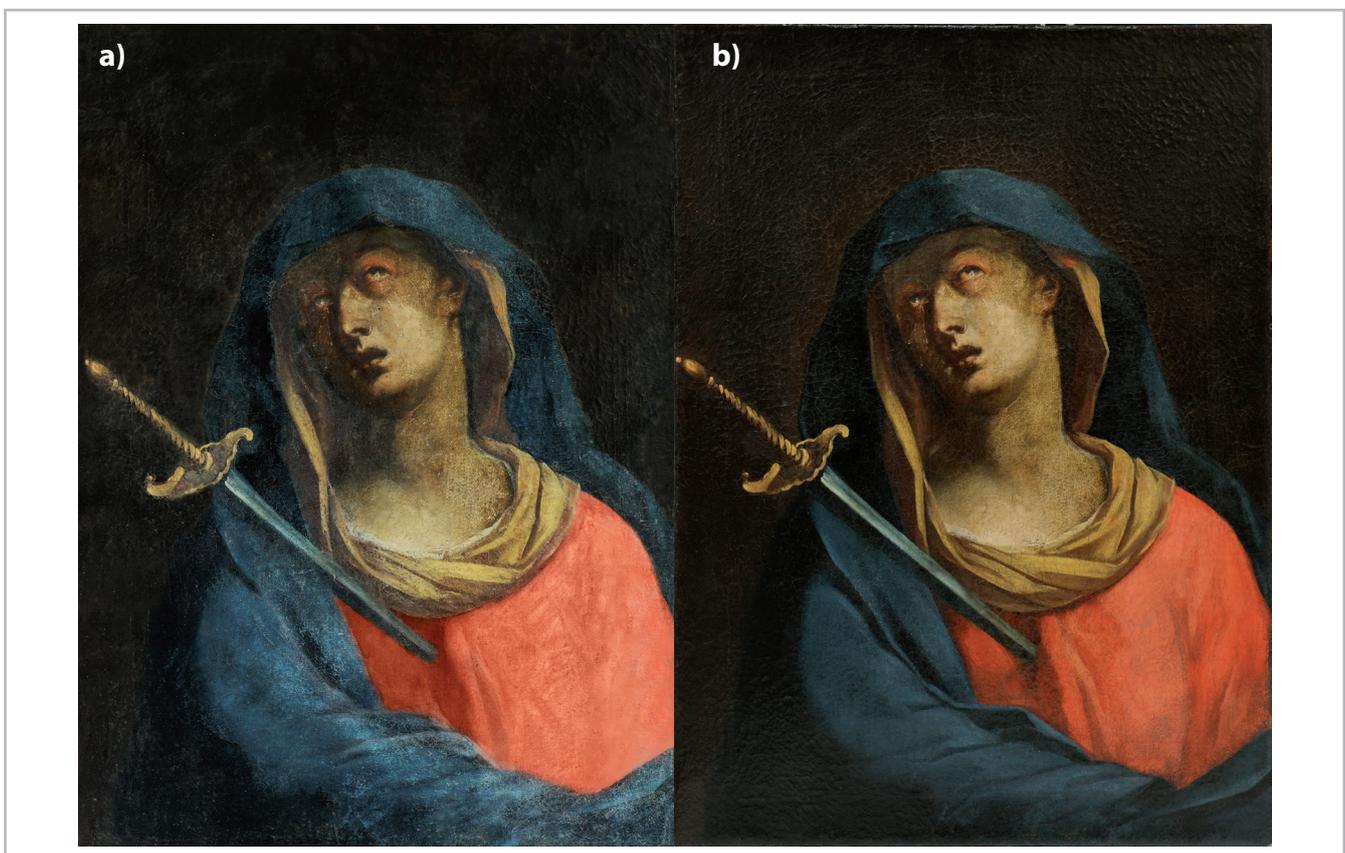

Figure 7.- ((a) The virtual image and (b) the actual painting after the treatment (© University of Ljubljana, Academy of Fine Arts and Design).

—Comparison of the virtual image and the actual painting

The results of the virtual restoration and the final look of the actual painting allow for interesting discussions [Figure 7].

Focusing on the red garment, the first thing we notice when comparing the treated painting and the virtual image is that the results of the treated painting are not far from the "predictions" on the virtual image. The red garment on the virtual image looks similar to its counterpart on the treated painting. On the other hand, the blue drapery looks less similar since the overpaint had been removed on that area before the virtual image was made, leaving the paint layer unsaturated and with anomalies, giving the impression of uneven colour. These anomalies translated onto the virtual image while on the treated painting they were eliminated. This leads to the conclusion that the virtual image would appear more homogenous if it was created before any invasive procedures.

All in all, the X-ray photograph was the ideal starting point when identifying the original painting, and was easily implemented into the virtual image, even in the problematic area of the lower right corner with the blue and red drapery. When removing the overpaint it turned out that our predicted shape of the blue drapery was indeed quite precise despite ambiguity about the ending of the red garment and small amount of the red paint layer remaining.

Conclusions

Virtual restoration of the painting turned out to be a great work experience. It was interesting to work on, created in a short period of time, and it helped with the documentation process. It was a way of collecting visual information. An important part was the manual execution of the virtual image, since it proves every conservator can use graphic software for the preliminary exploration of the work without needing prior knowledge. That being said we should always consider an interdisciplinary approach, collaborating with experts in that field especially when presenting the intended work to the general public.

During the creation of the virtual image, we gained important insight into the painting technique; the movement of the brushstrokes created lined texture on the red drapery and brown overhead scarf which was hidden underneath the overpaint. This information helped with a fluent execution of the restoration procedures. Implementing chromatic reintegration was efficient as we had previously visually determined the extent of the treatment. It is crucial to keep in mind the importance of good preparation and planning of treatments on the virtual image because the information gained from the research unconsciously affects the actual treatment of the painting.

The cross-section microscopy analysis was important for the overall conformation of the overpaint; however, the surface of the painting is heterogenous hence we aren't capable to determine how the original painting looked like using only that method. The comparison between the actual painting and the simulation allows for some interesting observations. Main differences derive from the fact that we were focusing on the reconstruction of the red garment area, leaving the blue drapery in a state after removal of the overpaint. Advantages of the method are collected and visually documented pieces of information from different sources and prediction of the original. A disadvantage would be over-modelled painting. An important point to consider is the fact that the results are only predictions, which poses the question of whether the simulation could suffice for the aesthetic presentation in which case the removal of the overpaint would be unnecessary. In the case of *Mater Dolorosa*, belonging to the National Gallery of Slovenia, poorly done overpaint significantly lowered the painting's aesthetical value, therefore it was decided to be removed. If it was decided to preserve the overpaint for the historical value of the painting, the virtual image of the predicted original condition would be a useful contribution to the presentation.

References

AMBROŽIČ, N. (2013). *Odstranjevanje laka in preslikav na sliki Marka Layerja Mater Dolorosa*. Diplomsko delo. Ljubljana: University of Ljubljana.

BARNI, M.; BARTOLINI F.; CAPPELLINI, V. (2000). "Image processing for virtual restoration of artworks", *IEEE Multimedia*, 7: 34-37, https://doi.org/10.1109/93.848424.

BATIHA, K., AL-SALAIMEH, S., BESOUL, K. (2007). "Digital Art and Design", *International Journal Information Technologies and Knowledge*, 1: 147-151, http://hdl.handle.net/10525/245.

BUZZANCA, G. (2000). "A User-friendly Approach (... More About Standards and Customized Menus in Digital Recording of Condition)". In *GraDoc, Graphic Documentation Systems in Mural Painting Conservation*, Schmid, W. (ed.), Rome: ICCROM, 147-159.

KAVKLER, K., JUVAN, P., PRESTOR, M. (2012). *Marko Layer, Mater Dolorosa, Narodna galerija: poročilo naravoslovnih preiskav*. Ljubljana: Zavod za varstvo kulturne dediščine, Restavratorski center.

LIMONCELLI, M., SCHEPIS, L., GERMINARIO C. (2017). *Virtual Restoration. Paintings and mosaics*. Rome: «L'ERMA» di BRETSCHNEIDER.

MACBETH, R. (2012). "The technical examination and documentation of easel paintings". In *Conservation of Easel Paintings*, Rushfield, R., (ed.). London: Routledge, 291-305.

MOORE, M. (2001)."Conservation Documentation and the Implications of Digitisation". *Journal of Conservation and Museum Studies*, 7: 6-10, http://doi.org/10.5334/jcms.7012.

SAUNDERS, D., CUPITT, J., PADFIELD J. (2006). "Digital Imaging for Easel Paintings". In *Digital Heritage: Applying Digital Imaging to Cultural Heritage*, *Macdonald*, L., (ed.), Amsterdam etc.: Butterworth-Heinemann / Elsevier, 521-547.

STERLE, A. (2019). *Estetska prezentacija preslikane baročne slike Mater Dolorosa Marka Layerja*. Diplomsko delo. Ljubljana: University of Ljubljana.

STOLS-WITLOX, M., ORMSBY, B., GOTTSEGENIN, M. (2012). "Grounds 1400–1900 and Twentieth-century grounds". In *Conservation of Easel Paintings*, Rushfield, R. (ed.). London: Routledge, 161-188.

RENÉ DE LA RIE, E., QUILLEN LOMAX, S., PALMER, M., DEMING G., MAINES, C. A. (2000). "An investigation of the photochemical stability of urea-aldehyde resin retouching paints: removability tests and colour spectroscopy", *Studies in Conservation*, 45: 51-59, https://doi.org/10.1179/sic.2000.45.Supplement-1.51.

Author/s

Ana Sterle
ana.sterle96@gmail.com
University of Ljubljana, Academy of Fine Arts and Design

Ana Sterle was born in Ljubljana, on October 11, 1996. In 2015 she started studies in the conservation of works of art at the University of Ljubljana, Academy of Fine Arts and Design. In 2019 she studied conservation of contemporary art at ESAPA, Spain and the same year graduated at the University of Ljubljana, Academy of Fine Arts and Design. She is now a student of a postgraduate program of conservation of easel paintings at the University of Ljubljana, Academy of Fine Arts and Design.

Lucija Močnik Ramovš
lucija.mocnikramovs@aluo.uni-lj.si
University of Ljubljana, Academy of Fine Arts and Design

Lucija Močnik Ramovš graduated in painting in 1996 at the Academy of Fine Arts and Design, University of Ljubljana, and in 1999 she completed her Master's Study in Conservation/Restoration. She is an Associate Professor at the Academy of Fine Arts and Design, University of Ljubljana, in charge of the courses in conservation/restoration of paintings on canvas. She is a member of expert committees of the Ministry of Culture of the Republic of Slovenia and the Association of Slovene Restorers. In her professional work, she mainly focuses on oil paintings on canvas and, in close cooperation with the Restoration Centre of the Institute for the Protection of Cultural Heritage, she also carries out specialist training workshops.