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The instrument transfer method in four handed dentistry in dental operating microscope as a module of a training program in the aspect of reduction of the dynamic load of the visual system of the operator

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Resume. Introduction of a Dental Operating Microscope (DOM) in the clinical work can make some difficulties in operator's work. In particular, to ensure the safety of the operator's visual system and ergonomics of the work, the operator's gaze should be continuously directed to the operating field. The instruments should be moved over the operating field by the assisting personnel, whose participation in the transfer is not complete until the evening instrument is visible through the microscope and the operator is fully capable of controlling its movement. Instrument transfer method in DOM includes 3 steps: modified direct placement, pre-delivery, delivery and exchange of instruments. In the presented method the most important elements are the properly oriented end of the instrument by dental assistant and mutual grasp of instrument. The method allows to reduce the load on the operator's visual system and to make four-handed work ergonomic.

Key words: dental operating microscope (DOM), four-handed dentistry in DOM, instrument transfer in DOM, mutual grasp, visual system overload of dental operator.

Introduction

Introduction of a Dental Operating Microscope (DOM) in the clinical work creates totally new and different working conditions. When working with the DOM the field of view of the operator is limited – the higher the magnification, the more limited it is. As a result, the operator cannot see their own hand when reaching for the instrument. Having no visual information on the surroundings, many operators find it very difficult, if at all possible, to introduce the instrument to the oral cavity safely. The issue is often tackled by taking one's eyes off the eyepiece and following hand movements until the instrument is placed within the operating field. Unfortunately, such an approach is not ergonomic and can lead to visual system overload.

To solve this problem the instruments should be moved over the operating field by the assisting personnel, whose participation in the transfer is not complete until the instrument is visible through the microscope and the operator is fully capable of controlling its movement. Performing transfers in this manner allows to minimize load of the visual system of the operator.

Instrument transfer method in DOM

The method of the instrument transfer in DOM is a combined direct placement with parallel exchange method, suggested to be used in over-the – patient and transthorax delivery systems. It consists of the following steps:

Step I: modified direct placement

Refers to the start of treatment and thus applies to diagnostic instruments – the probe and the dental mirror.

- Hands of the operator are located in close proximity to the visual track of the microscope, so he/she does not see them looking through the eyepiece.
- The DA transfers the instrument with a two- or three-finger grasp of the right hand to left hand of the operator. The operator takes the mirror with a three-finger or palm grasp.
- The DA puts the operator's hand with a mirror within the visual track of the microscope, holds and releases the grasp withdrawing the right hand. So for a moment the mirror is held by both the DA and the operator.
- At the same time the DA is holding the probe by the non-working end in the left hand and with a two, or three-finger grasp puts it into the hand of the operator. The operator takes over the probe with a pen grasp.
- The DA puts the probe together with the operator's hand within the visual track of the DOM. For a moment the instrument is held, like the mirror, both by the DA and the operator.
- At the time when the instrument is within the visual track, the DA releases the grasp and withdraws the hand (Fig. 1.1–1.6).
- The operator with both diagnostic instruments, respectively, handed over by the DA, does not have to take eyes off the eyepiece of the DOM.

They are so called direct placements and relate to the situation when the operator does not hold any instruments e.g. when beginning an examination or is going to give an injection of an anesthetic.

In conventional dentistry direct placement is the simplest and most basic delivery sequence, whereas when working in the DOM it is enhanced by the following sequences:

- the DA placing the operator's hand with the properly placed instrument within the visual track of the DOM,
- the DA temporary holding the hand of the operator within the visual track of the DOM before the operator is ready to perform a specific procedure with the picked-up instrument (this stage of the instrument transfer was named by the authors 'the mutual grasp'. It must be present in working with the DOM in all instruments' transfer for it to be performed according to the rules of dental ergonomics).

Step II: predelivery

- The DA holds the instrument in the left hand by the non-working end with a two- or three-finger grasp, parallel to the instrument which the opera-

tor is working with, with his right hand – applies to right-handed operators (Fig.2.1–2.2) (with left-handed operators the situation is reversed – the DA holds the instrument with the right hand parallel to the instrument held in the left hand by the operator).

- The DA, when beginning the transfer, approaches the visual track of the DOM with the left hand holding the instrument in it's delivery part.

Step III: delivery and exchange

At the sign given by the operator or through observation of the monitors or direct observation by the DA at the time when the operator finishes working with one instrument, the DA starts the transfer of the next instrument.

- The operator slightly moves the hand with the instrument that was being used, away from the operating field.
- The DA with the pick-up part of the hand takes the instrument from the hand of the operator and gives him yet another instrument which is moved within the visual track of the DOM. The operator takes the instrument with a pen grasp. For a moment the instrument is held by both the DA and the operator ('the mutual grasp').

- After the delivery of the instrument into the operator's hand, the DA moves the hand away with the picked-up instrument (Fig.3.1–3.6)

In the procedure of the transfer of instruments there is a strict rule which basically states that the instrument must return exactly to the same place where it was taken from by the DA [Bladowski 1999].

The same principle as above, applies to the transmission of dynamic instruments such as the high-speed and low-speed handpieces (Fig 4.1–4.6), or static and dynamic instruments, e.g. a high-speed handpiece and a probe (Fig. 5.1–5.6), if allowed by the design of the main console of the dental unit (tubing with attached dynamic instruments over the top of the instrument console of the dental unit) [Hokwerda et al. 2006].

The method of transfer of instruments in conservative dental procedures in the work with four-handed technique with the use of a DOM differs from conventional methods present in dentistry for many years and described by number of authors [Chasteen 1978, Paul 1992, Bladowski 1999, Finkbeiner B.L. 2001, Hokwerda et al. 2006, Valachi B. 2006].

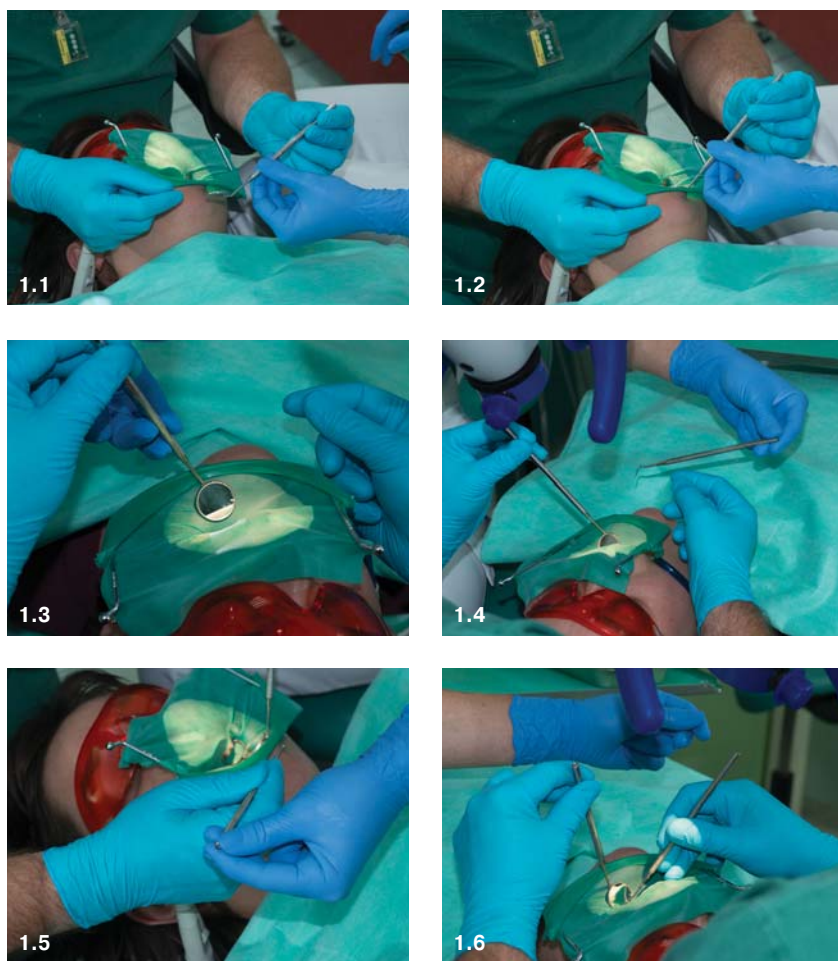


Fig. 1 (1.1–1.6). Instrument transfer method in DOM – modified direct placement.



Fig. 2. Instrument transfer method in DOM. Predelivery.

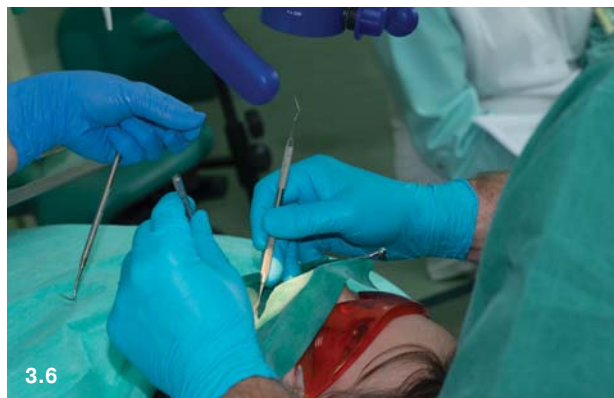
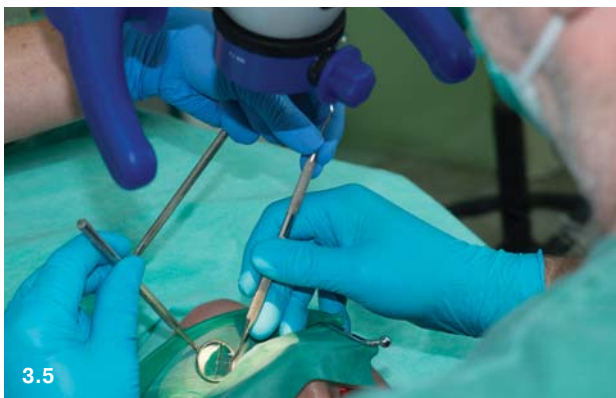
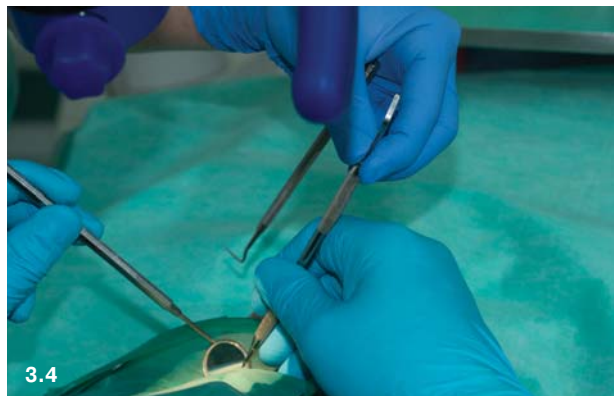


Fig. 3. (3.1–3.6). Instrument transfer method in DOM. Delivery and exchange of static instruments.

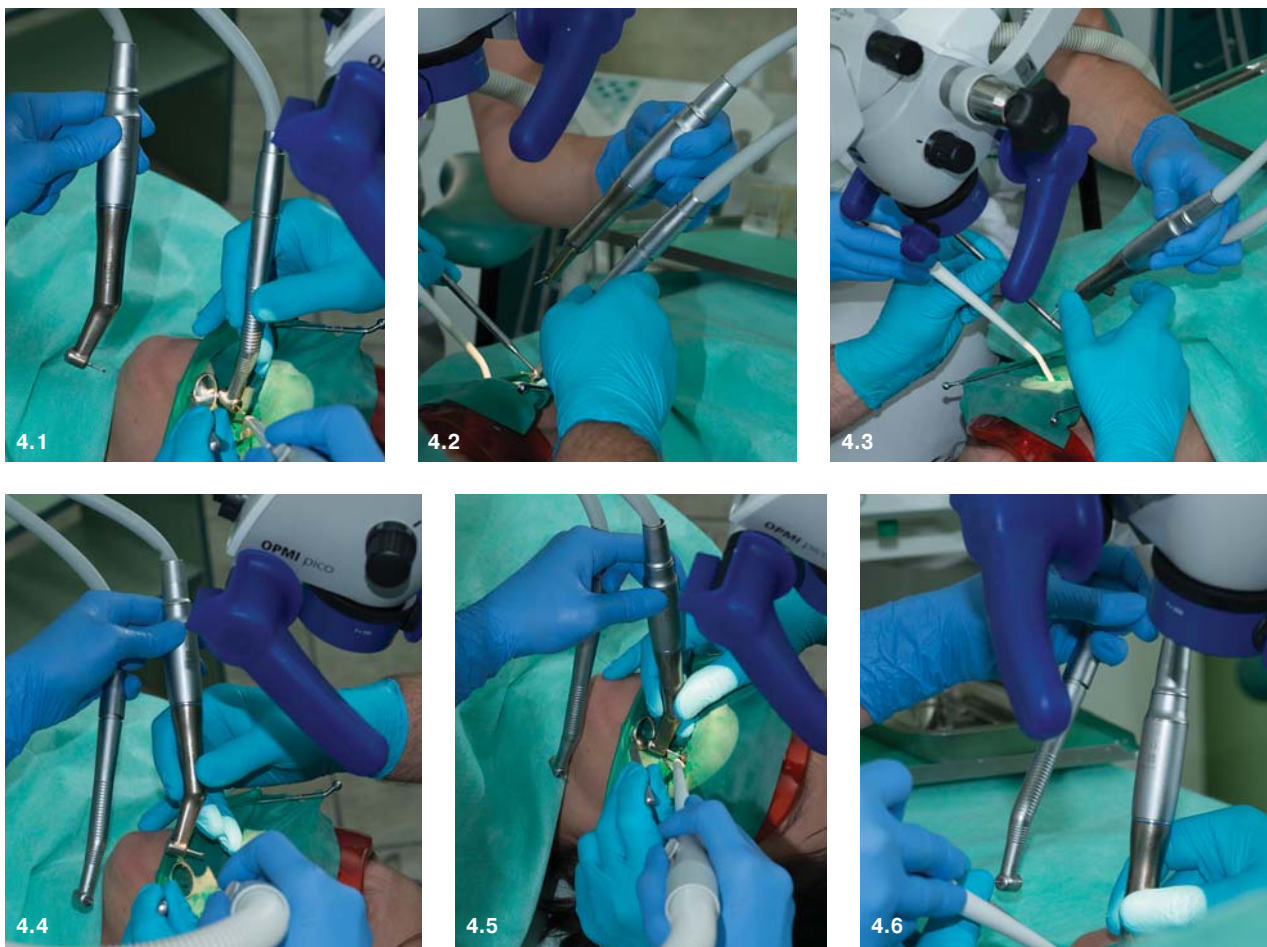


Fig. 4 (4.1–4.6). Instrument transfer method in DOM. Delivery and exchange of dynamic instruments.

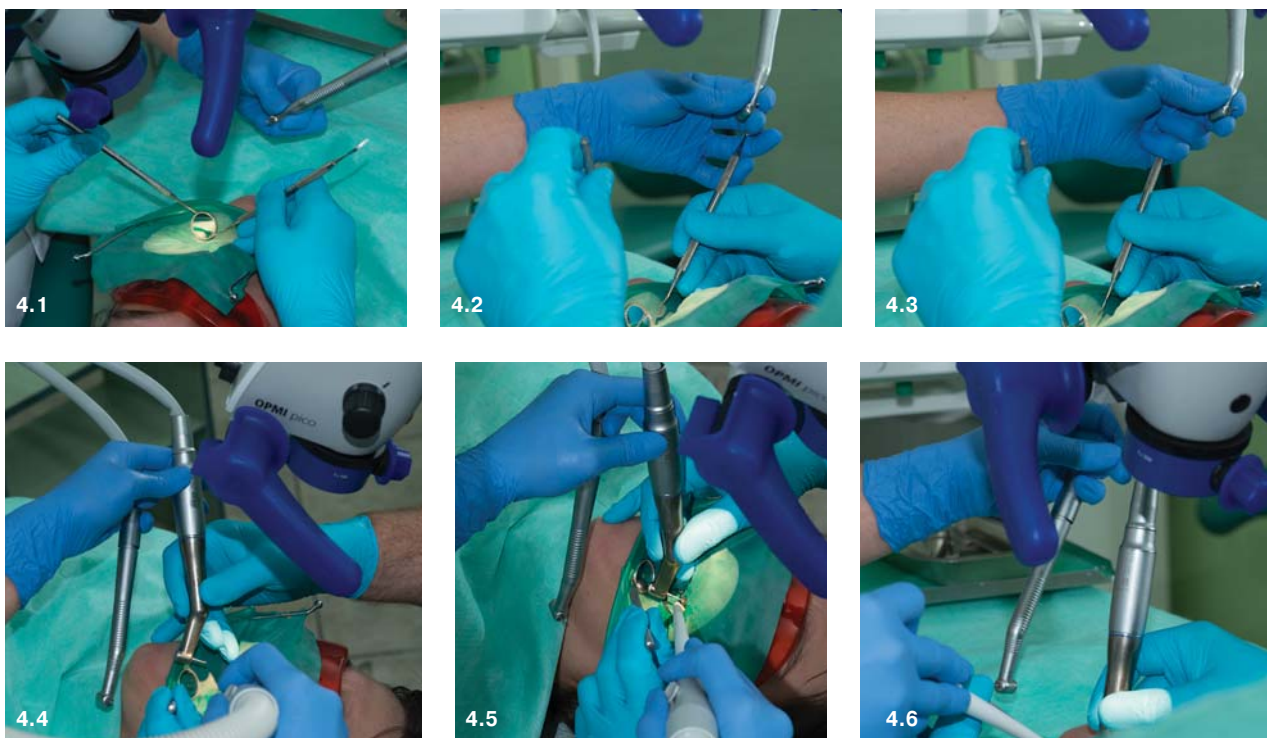


Fig. 4 (4.1–4.6). Instrument transfer method in DOM. Delivery and exchange of dynamic instruments.

In the presented method, the most important element in the instrument transfer in four-handed dentistry with the use of DOM is the introduction, by the DA, of the properly oriented end of the instrument

and placing her hand together with hand of the operator whilst holding the same instrument (mutual grasp) and keeping the hands within the visual track of the DOM.

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Метод передачі інструментів в стоматології чотирьох рук з стоматологічним операційним мікроскопом, як модуль навчальної програми в аспекті зниження динамічного навантаження зорової системи оператора

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Резюме. Впровадження стоматологічного операційного мікроскопа (POM) у клінічну роботу може ускладнити роботу оператора, зокрема, для забезпечення безпеки зорової системи оператора та ергономічності роботи погляд оператора повинен бути постійно спрямований на операційне поле. Інструменти повинні переміщатися операційним полем за допомогою обслуговуючого персоналу, участь якого в переносі не завершується доти, доки весь інструмент не буде видно в мікроскоп і оператор не зможе повністю контролювати його рух. Метод передачі інструментів у DOM включає 3 етапи: модифіковане пряме розміщення, попередня доставка, доставка та обмін інструментів. У представленому методі найбільш важливими елементами є правильно орієнтований кінець інструменту асистентом стоматолога та взаємне захоплення інструменту. Метод дозволяє знизити навантаження на зорову систему оператора і зробити роботу в чотири руки ергономічною.

Ключові слова: дентальний операційний мікроскоп (DOM), чотириручна стоматологія в DOM, перенесення інструменту в DOM, взаємне захоплення, візуальний навантаження системи стоматолога.

Метод передачи инструмента в стоматологии четырех рук с стоматологическим операционным микроскопом, как модуль учебной программы в аспекте снижения динамической нагрузки на зрительную систему оператора

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Резюме. Внедрение стоматологического операционного микроскопа (POM) в клиническую работу может затруднить работу оператора, в частности, для обеспечения безопасности зрительной системы оператора и эргономичности работы взгляд оператора должен быть постоянно направлен на операционное поле. Инструменты должны перемещаться по операционному полю с помощью обслуживающего персонала, участие которого в переносе не завершается до тех пор, пока весь инструмент не будет виден в микроскоп и оператор не сможет полностью контролировать его движение. Метод передачи инструментов в DOM включает 3 этапа: модифицированное прямое размещение, предварительная доставка, доставка и обмен инструментами. В представленном методе наиболее важными элементами являются правильно ориентированный конец инструмента ассистентом стоматолога и взаимный захват инструмента. Метод позволяет снизить нагрузку на зрительную систему оператора и сделать работу в четыре руки эргономичной.

Ключевые слова: дентальный операционный микроскоп (DOM), четырехручная стоматология в DOM, перенос инструмента в DOM, взаимный захват, визуальная перегрузка системы стоматолога.

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