Vasundhara’s mirror exercise sheets and shields – A novel indirect vision training device

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Abstract

Background: Mastering indirect vision has been a common challenge to undergraduate and postgraduate dental students.

Aim: This study assessed the usefulness of Vasundhara’s mirror exercise (V-ME) Shield and Sheets for learning indirect vision among dental students.

Materials and Methods: One hundred 2nd year undergraduate students participated in the study who had just started their preclinical operative exercises. All the participants of the study group were asked to prepare a Class I amalgam cavity on maxillary left first molar typodonts followed by evaluation by a single evaluator. Then, all the participants were exposed to 21 days’ practice of indirect vision exercises for 15 min using V-ME Shields and Sheets under supervision. Again, all the participants were asked to prepare a Class I amalgam cavity in maxillary left first molar typodonts followed by evaluation by the same evaluator. All the participants were asked about the usefulness of the device by requesting them to fill out the feedback form. The entire results were tabulated and statistically analyzed. Statistical analysis was done by one-way analysis of variance (P < 0.05) using IBM SPSS (version 21.0) software.

Results: Students after being trained with the V-ME device performed better in indirect vision. According to the results obtained it is concluded that indirect vision can be mastered by practice and it also helps in precision work in clinical practice.

Conclusion: V-ME shields and sheets are novel, simple, and cost-effective way to start practicing mirror vision skills during preclinical studies and to improve neurophysiological adaptation.

Keywords: Dental education; indirect vision; neurophysiological adaptation; Vasundhara’s- mirror exercise shield

INTRODUCTION

The mouth mirror is a valuable armamentarium in the field of dentistry favoring visualization of the field of operator either directly or indirectly. Hence, expertise in the usage of mouth mirror is equally important.[1]

There are inaccessible areas in our dentition that demand indirect vision in our day-to-day clinical practice. If we try using direct vision in these difficult-to-access areas this can lead to musculoskeletal disorder due to physiologically adverse contortion and bending of the body. Dental students in their initial attempts in practicing indirect vision exercises experience frustration and irritation and tend to avoid using mouth mirrors in visualizing teeth in the maxillary arch.[2,3]

Various models such as Mirror prep, Jumpstart, and PhantHome are available to train students at a predoctoral level to practice indirect vision. The training apparatus Mirror-prep consists of a U-profile high-quality steel sheet with a mirror mounted to its rearmost wall and a replica of a dental drill holding a short pencil, whereas, the Jumpstart device comprises...
PhantHome is a similar mobile device with desktop fixation, silicone simulating soft tissue with a portable drilling training tool. However, all of these devices require a turbine or other electrical tools for training and are expensive. Its availability is also not easy to be adopted into the dental curriculum.\cite{6,7}

Hence, to incorporate indirect vision culture in an early learning phase, a novel, cost-effective, and simple self-designed device named Vasundhara’s mirror exercise (V-ME) was thought necessary.

V-ME Shields and Sheets are easy to fabricate and can be self-designed by the students, that will block the direct vision and train them to work in a neutral position, thereby preventing the development of work-related postural imbalances.

With regard to this aspect, the present study is to evaluate the efficacy of self-designed V-ME Shields and Sheets to master indirect vision.

**MATERIALS AND METHODS**

**Materials required**

Thick chart paper, Protractor, Scale, Compass, Scissors, Pencil, Marker pen, Protective eyewear, 3M Bio-tape [Figure 1].

Steps to fabricate V-ME Shields [Figure 2]:

Step 1: Two points are marked at the top part of the thick chart paper at a distance of 31 cm apart (Point A and Point B) and these points are joined by a line.

Step 2: Two perpendicular lines are drawn downward each from the two points already marked, which has a length of 10 cm. The endpoints (Point C and Point D) are joined so that it forms a rectangle.

Step 3: Two points are marked on the line CD (Point E and Point F), such that each point is 4 cm away from point C and D, respectively.

Step 4: Taking E and F and the center, mark two points G and H which is at an angle of 110°.

Step 5: Points G and H are then joined by an arc.

Step 6: The center of the arc is marked and two points I and J are marked at a distance of 1.5 cm from the center of the arc.

Step 7: Two points K and L are marked upward from points I and J respectively at a distance of 1.5 cm and joined with a dotted line.

Step 8: Using scissors cut out the chart paper as points joining (ABCDEHJIGFDA) in the sequence.

Step 9: After cutting it out two slits has to be given that joints the points IK and JL, respectively (taken as the nose piece) [Figure 3].

**V-ME sheet**

V-ME sheet is a specially designed sheet to practice indirect vision exercises by joining the dots, tracing the path, and shading the outline form of class I amalgam cavity on maxillary premolars and molars [Figure 4].

One hundred 2nd year undergraduate students participated in the study.

On the 1st day of the study, the students were asked to prepare conventional class I amalgam cavity preparation on maxillary first molar typodont tooth within 40 min. The prepared cavity of each student was then evaluated by a single evaluator on a 10-point grade sheet that included 10
important features of cavity preparation. The scores were recorded as PREV-ME scores [Table 1].

The participants then underwent 21 days of indirect vision exercises using V-ME shields and sheets. Participants were asked to block their direct vision using V-ME shields. This was done by first taping the V-ME shield onto their nose bridge using a 3M Biotape, and adapting it properly to the facial contour. The students were asked to wear a protective eyewear to simulate the clinical posture. The indirect vision exercise was done by holding a mirror in front of them and practicing the following exercises such as joining the dots, drawing the path, and sketching the outline form for maxillary premolar and molar as shown in the V-ME sheet. This exercise was carried out for 15 min each day for 21 days [Figure 5].

On the 23rd day of the study, the participants were again asked to prepare conventional class I amalgam cavity preparation on maxillary first molar typodont tooth within 40 min. The prepared cavity was evaluated by the same single evaluator on a 10-point grade sheet that included 10 important features of cavity preparation. The scores were recorded as post-V-ME scores and tabulated.

Then, the participants were also asked to rate the usefulness of the study on a five-grade scale.

- 1: Not useful
- 2: Slightly useful
- 3: Useful
- 4: Very useful
- 5: Extremely useful.

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software version 21.0. Data were presented as mean and standard deviation values. Data were analyzed using one-way analysis of variance.

**RESULTS**

The results obtained represent the effectiveness of V-ME shields and sheets. The students had scored an average of 2.8 for the cavity preparation before indirect vision exercises. A significant increase of the scores with an average of 6.26 is seen after the students were exposed to indirect vision training using V-ME shields and sheets [Graph 1].

A $P = 0.000$ was obtained which strongly rejects the null hypothesis and gives strong evidence that V-ME shields and sheets helped in mastering indirect vision.

**DISCUSSION**

Successful instruction of novice preclinical learners requires an understanding of psychomotor skills, theory, motor
performance, and implicit learning. For novice students, explicit directions given in small steps and provision of timely and feedback on performance are techniques that will facilitate the learning of motor skills.\[8\] Continued practice improves performance. Recognition skills in which the student learns to visualize an appropriate result should be formally taught and emphasized before any skill performance.\[7,9\]

It has been recognized that the extent of transfer of training between one learning task to another depends on the similarity of the tasks.\[10\] Therefore, to assure a high degree of transfer from a motoric activity learned in V-ME tool to motoric tasks required in the clinical cavity preparation in typodonts, both tasks must have comparable components. Hence, all the participants of the study were asked to prepare conventional class I amalgam cavity after receiving training with V-ME device.\[8,10\]

Our study reported similar results to some previous studies. Gagne and Foster investigated the extent of transfer in learning of a complex motor skill when varying amounts of initial practice are given for a task that is itself a component activity of the required skill. Their research provides evidence of a relationship between the amount of preliminary practice and the learning of a complex motor skill. The authors concluded that the extent of learning transferred and the ease of learning a complex skill depends both on the degree of similarity between the tasks and on the amount of previous practice.\[11\]

Consistent with our study, Gansky et al. investigated the reliability and validity of a manual dexterity tests to predict preclinical grades and concluded that manual dexterity can be acquired and improved by means of exercise, and ability tests should be mainly used for identifying the weakest students before preclinical courses, to offer them more training so that they may achieve the dental performances required.\[6\]

These V-ME shields and sheets were accepted with pleasure as a kind of sporting challenge by the students. V-ME shields and sheets are found to be a novel, simple and cost-effective way to master indirect vision at a predoctoral level. Our study supports the conclusion that two-dimensional motor skills with indirect vision can be improved by practicing with V-ME shields and sheets.

The feedback received from participants showed that 71% of participants found this indirect vision training to be very useful [Graph 2]. Taking into account finding from previous studies as well as our own, we consider V-ME shields and sheets to be an effective way to begin practicing two-dimensionally in preclinical courses and to continue practicing three-dimensionally on dental mannequins.

**Limitation of the study**
The three-dimensional movement of the mouth mirrors held in various positions for clinical visualization and the water spray settling on the mouth mirror as observed during the clinical practice could not be simulated in this indirect vision exercise study.

**Conclusion**
Our study supports the fact that neuromotor skills can be improved significantly by practicing indirect vision exercises using V-ME shields and sheets. And considering the student’s evaluation on the helpfulness of indirect vision training, it can be inferred that these exercises make the transition to clinical work easier for the students.
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Conflicts of interest
There are no conflicts of interest.

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