



PAIN ASSOCIATED WITH THE WORK OF DENTAL ASSISTANTS: CAUSES AND SOLUTIONS

Being able to work pain-free is a real challenge for dental assistants. Pain reduces job satisfaction, can lead to loss of work time, and even shorten career longevity. This article will attempt to explain some of the causes of this pain and also provide information about new support features for dental assistant stools, designed to reduce work-related pain. Users were recently surveyed to investigate the effectiveness of this new stool.

The Association paritaire pour la santé et la sécurité du travail du secteur des affaires sociales (ASSTSAS) has been studying musculoskeletal disorders (MSDs) in dental clinics since 1977. Ergonomic studies were conducted, leading to the publication of "*Guide de prévention des TMS en clinique dentaire*" in 2002, revised in 2007, excerpts of which have been translated in "*Prevention of Work-Related MSDs in Dental Clinics*." These studies looked at the workstations of hygienists, assistants, and dentists. In 1999, ASSTSAS asked Posiflex Design to develop free-motion elbow supports for hygienists and dentists. A study using electromyography was conducted (Proteau, 2001), demonstrating the benefits of using these free-motion elbow supports which were launched on the market in 2002. Since then, more than 3,000 pairs have been sold in the U.S. and Canada.

Dental assistants also tried out these free-motion elbow supports, but most found that the supports did not provide enough arm and torso stability when holding instruments. ASSTSAS then asked the same manufacturer to develop a fixed, wider version of the elbow rests that would provide enough support for the assistant when working facing the patient (without having to twist her back). The Posiflex 8, a stool featuring a "wide figure 8-shaped elbow rests and torso support" was introduced in 2006. In August 2008, ASSTSAS contacted many of the dental clinics that had purchased the new stool and asked the assistants to fill out a questionnaire about its use. The results of this study are presented in part two of this article.

Continued page 17

DOULEURS ASSOCIÉES AU TRAVAIL DES ASSISTANTES DENTAIRE : CAUSES ET SOLUTIONS

Travailler sans douleurs est un défi pour les assistantes dentaires. Les douleurs diminuent la satisfaction au travail, peuvent entraîner des absences et même menacer le maintien dans l'emploi. Cet article présente certaines causes de ces douleurs. Vous y trouverez aussi de l'information sur les nouveaux appuis pour les tabourets d'assistantes, conçus pour diminuer les douleurs causées par le travail. Une enquête a permis d'en vérifier l'efficacité auprès d'utilisatrices.

L'Association paritaire pour la santé et la sécurité du travail du secteur des affaires sociales (ASSTSAS) étudie les troubles musculo-squelettiques (TMS) en clinique dentaire depuis 1977. Des études ergonomiques ont amené la rédaction du *Guide de prévention des TMS en clinique dentaire* en 2002, révisé en 2007. Les études ont couvert des postes d'hygiénistes, d'assistantes et de dentistes. En 1999, l'ASSTSAS a demandé à Posiflex de développer des appuie-coudes mobiles pour les hygiénistes et les dentistes. Ils ont fait l'objet d'une étude avec électromyographie (Proteau, 2001) qui a démontré leurs effets bénéfiques et ils ont été mis en marché en 2002. Depuis, plus de 3 000 paires de ces appuis ont été vendus au Canada et aux États-Unis.

Des assistantes ont essayé les appuie-coudes mobiles. Pour la majorité d'entre elles, ils n'offraient pas suffisamment de stabilité aux bras et au tronc pour tenir les instruments. L'ASSTSAS a donc demandé au même fabricant de développer des appuis plus larges pour permettre à l'assistante de s'y appuyer tout en travaillant face au client (sans torsion du dos).

En 2006, le tabouret avec appuie thoracique élargi en appuie-coudes Posiflex 8 a été mis sur le marché. En août 2008, l'ASSTSAS a contacté plusieurs cliniques dentaires qui avaient acquis ce tabouret et demandé aux assistantes de répondre à un questionnaire sur son utilisation. Les résultats de cette étude sont présentés en deuxième partie de cet article.

Continuer sur page 7



Pain Associated With The Work Of Dental Assistants: Causes And Solutions *continued from cover*

Rose-Ange Proteau, ergonomist Association paritaire pour la santé et la sécurité du travail du secteur des affaires sociales (ASSTSAS), Quebec

PART 1

Basic concepts of anatomy and biomechanics

Here are a few basic physiology concepts to explain why muscles, tendons and joints can develop pain and injuries.

1. Definition of MSDs

Musculoskeletal disorder (*MSD*) is the term commonly used to describe the pain and disability resulting from job-related constraints which can lead to long-term injuries. MSDs can be caused or aggravated by work-related hazards or risks.

Pain is a protective mechanism and the symptoms of MSDs should be considered a warning. Signs such as pain or discomfort should not be ignored.

2. Onset and development of MSDs

Many structures in the musculoskeletal system can be affected by long-term wear and tear, which is characteristic of occupational injuries. Additionally, a job-related situation could aggravate an injury and lead to a sudden, significant increase in pain, and resulting inability to continue working. Injuries can occur in different ways, including:

- Long-term wear and tear
- Suddenly or following an aggravating situation
- Combination of both factors.

3. MSDs caused by a combination of factors

MSDs can be related to a combination of constraints: holding a position, force, and repetitive movements. Problems vary according to the part of the torso affected. One or more factors may be involved, and a combination of factors increases the risk of injury.

Injuries may be caused by repeating the same movements over and over; or by holding a static position (i.e. lack of movement). The upper back and shoulders in particular are affected by the muscular contractions required to stabilize the arms and hold the head upright.

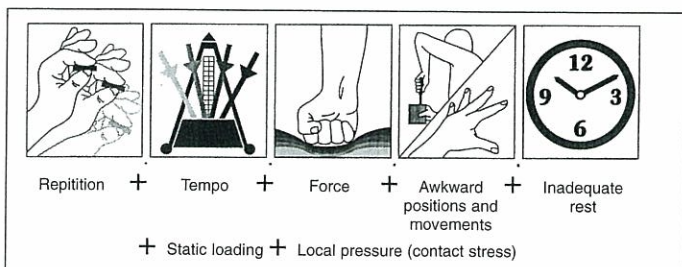


Figure 1. Combination of factors may cause musculoskeletal injuries.

3.1 Combination of constraints

Dental assistants face a number of risk factors on the job:

- **Holding static neck and upper back positions** with the head bent forward and to the side to be able to see into the patient's mouth;
- **Holding static positions involving the shoulder girdle muscles** (shoulders and upper back) when the elbows are held out from the torso without support;
- **Static positions** involving the lower back muscles when seated, bending forward or bending to the side (torso flexed and twisted);

- **Awkward** (deviating from neutral) wrist positions required to hold instruments at the necessary angle;
- **Wrist strength** required to hold the instruments;
- **Repetitive movements** involving twisting and extending the wrists, rotations from the elbow to hand instruments to the dentist;
- **Inadequate rest**, especially working 12-hour shifts, and/or six hours without a break;
- **Combination of the above factors.**

4. Sites and causes of the most common MSDs

Although many risk factors can cause MSDs, they can be grouped into the following three categories:

- MSDs caused by too many (repetitive) **movements**;
- MSDs caused by too **few movements**, i.e. holding static positions;
- MSDs caused by repetitive movements **and** holding static positions.

4.1 Repetitive movements

There is no clear boundary between what is repetitive and what is not. However, it is generally agreed that when the same work cycle or movement is repeated every few minutes, this constitutes repetition.

Tasks involving repetitive movements, i.e. performing a task or series of movements over and over, with little variation, contribute to the development of MSDs. Often just a small group of muscles or torso part is used, which become fatigued, while the rest of the torso remains largely unused.

4.2 Static positions

A static position involves the application of force without movement. However, even if there is some movement, if the joint does not return to a neutral position and muscle force continues to be required, the effect can be the same as not moving.

If you drop an object, gravity causes it to fall to the floor. The same is true when the torso is bent forward and the arms are held away from the body. Gravity pulls them toward the ground. They don't fall, because the muscles contract to pull in the opposite direction. When the muscles are contracted without moving, blood circulation is impeded. The muscles then receive less oxygen and nutrients and eliminate less waste produced by muscle work. In the long term, this changes the biochemistry of the muscle, resulting in a state of "functional muscle pathology."

Positions which require holding parts of the torso in a fixed position for extended periods of time (e.g. stabilizing a part, holding a tool, using a keyboard or mouse, etc.) can cause injuries.

In a dental clinic, holding an awkward position with little or no movement generally has more serious consequences on shoulder, neck, and lower back joints than positions that require too much movement.

Injuries, particularly in the shoulders and lower back, may be caused by one or both categories of movement, even within the same workstation (figure 2).

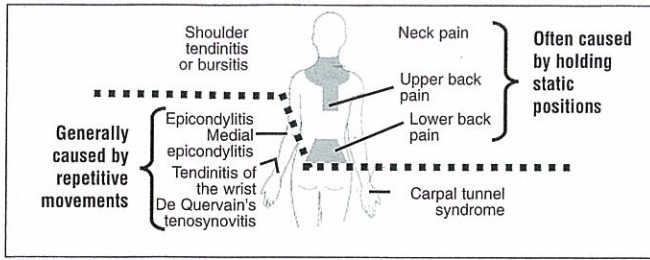


Figure 2. Most common sites and causes of MSDs

The origin of pain in the neck, upper back and lower back may be muscular, joint, or both. Muscle pain is related to functional muscle disorders or pathologies (e.g. hypertonicity, myalgia, myalgic indurated cords in the upper trapezius and erector spinae muscles). Joint pain in the cervical and lumbar regions may be related to minor intervertebral dysfunction (MID), disk degeneration, disk compression, or hernia.

4.3 Awkward positions: twisting of the lower back

The dental assistant has to adjust her working position to suit the dentist's. She sits higher than the dentist so that she can see over his or her hands. In one ergonomic study, a dentist worked with two assistants in two different positions. One assistant experienced upper back pain, while the other did not. The first one worked with her back twisted (figure 3) while the other assistant worked facing the patient (figure 4). Working opposite one another, the dentist and second assistant were able to alternate their legs under the chair, which allowed the assistant to work closer to the patient. The dentist did not notice the difference in the two assistants' positions. She had adjusted the patient's seat back to a flat position that was high enough for the assistant to be able to work facing forward (figures 14 and 15).

Unfortunately, most assistants are unable to choose their own working position. Since most dentists have been trained to work with their elbows at a 90° angle, they adjust the patient's seat back too low for the assistant to be able to slide her legs under the seat. In order to be close enough to see into the patient's mouth, the assistant has to twist her lower back while she does most of her work (figure 3).



Figure 3. When there is no room for her legs under the patient's seat back, the assistant has to twist her back, while keeping her legs parallel to the patient's chair.



Figure 4. There is less back twisting if the assistant can work at an angle; no back twisting if she can work facing the patient.

5. Assistant's stool with narrow torso support and no lumbar support

The assistant has to position herself carefully to avoid touching the dentist's instruments or disturbing the patient. The torso support is often too narrow for her to rest her arms on it when holding instruments in the patient's mouth (figure 5), so her arms are often unsupported. Static positions in abduction are a recognized cause of shoulder tendinitis and in dental work, many of these positions are held for extended periods of time. Furthermore, the majority of stools made for assistants have no lumbar support.

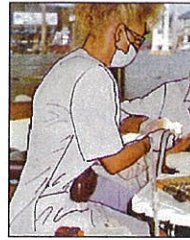
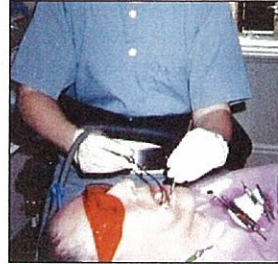


Figure 5. Problem situation: The dental assistant has to hold the instruments (suction, air-water syringe, light, etc.) accurately and without moving to avoid getting in the dentist's way. This means that she has to contract her shoulders and upper back. This stool has a narrow torso support and no lumbar support.

6. Solution: Assistant's stool with wide figure 8 elbow and torso support plus lumbar support

It is recognized that lumbar support is important for reducing static contractions of the lower and upper back muscles (Hardage, 1984).



Figures 6 and 7. A wide figure 8 elbow and torso support provides support for the assistant's elbows and allows her to get closer to the patient for better visibility into the oral cavity.



Figure 8. Assistant's stool with wide figure 8 elbow and torso support plus adjustable lumbar support that can be positioned forward.

PART 2

Study of the use of the Posiflex 8 assistant's stool with wide figure 8 elbows and torso support plus an adjustable lumbar support

7. Methodology

In August 2008, a study was prepared to assess the impact of using the Posiflex 8 stool. Following an initial telephone call, 32 screening questionnaires were faxed to the clinics that had purchased the stool within the previous two years. Twenty-four questionnaires were returned by 23 women and one man.

The purpose of the study was to identify changes made with the use of the stool with a wide figure 8 elbow and torso support by assistants who were accustomed to using a stool with a narrow torso support. The respondents were asked to indicate how long it took before they observed an improvement or deterioration in their symptoms. The average time required for changes to occur was five weeks; the time ranged from one to 24 weeks.

The average age of the respondents was 40 (range: age 23-65) and their average experience was 16 years (range: 1-37 years); 22 were right-handed, one was left-handed and one did not say. The assistants work an average of 33 hours per week (range: 21-40 weeks) in a four-day week (range 3-5 days); seven assistants have been using the stool since 2006, seven since 2007 and 10 since 2008. The results covered frequency of pain and changes in the workstation.

8. Frequency of pain

8.1 Parts of the body with pain, all frequencies

The questionnaire covered 11 parts of the body. There was a choice of four responses: *never*, *sometimes*, *quite often*, *all the time*. If we include the response *sometimes*, 100% of the assistants experienced pain over the past twelve months in the back (neck, upper back or lower back), 83% in the arms (shoulder, elbow, wrist) and 50% in the legs (hip, thigh, knee, calf, ankle/foot). Some 87% had taken medication or received treatments for pain relief.

The majority of the respondents felt pain in more than one place: with the narrow torso support, two-thirds (62%) had pain in four or more areas; in direct comparison with the wide figure 8 support, just one-third responded in the affirmative (33%).

8.2 Frequent back and arm pain

The following analyses present the results for the respondents who indicated a high frequency of pain, i.e. *quite often* or *all the time*. The "narrow torso support" group corresponds to the old stool, while "wide figure 8 support" corresponds to the *Posiflex 8* stool with a wide elbow and torso support plus an adjustable lumbar support that can be moved forward.

Two-thirds of the assistants had frequent low back pain with the narrow torso support. This percentage dropped to 29% with the wide figure 8 support and for the 40% of assistants with frequent neck, upper back and shoulder pain, the pain almost disappeared. Elbow pain, which affected about one-third of the respondents (29%) was also eliminated (figure 9).

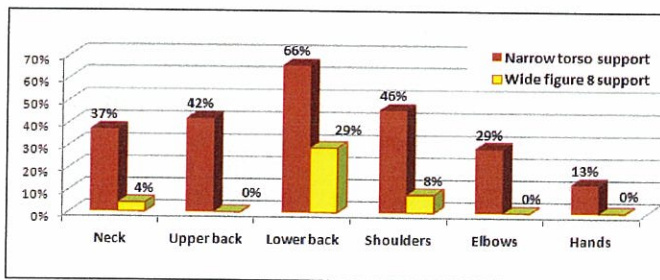


Figure 9. Percentage of assistants with pain *quite often* or *all the time* in the back and arms with the old stool with a "narrow torso support" compared to the new stool with "wide figure 8 support" (24 subjects).

8.3 Frequent leg pain

With the narrow bar, 25% of the assistants had hip pain. With the new wider support bar, this percentage dropped to 8% for hip pain and disappeared for thigh pain.

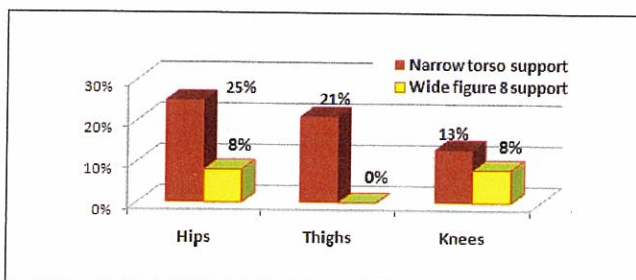


Figure 10. Percentage of assistants with pain *quite often* or *all the time* in the legs with the old stool with "narrow torso support" compared to the new stool with "wide figure 8 support" (24 subjects).

9. Changes in the work station

The questionnaire was also designed to check changes made in the assistant's workstation, to determine which factors had led to a reduction in the frequency of pain measured.

9.1 Most common positions

The most common working position used by assistants was beside the patient's head, with the lower back twisted. The percentage of assistants using this position dropped from 83% to 42% with the new stool. While previously, just one assistant had

been working facing the patient, now one-third were able to adopt this position, and one-quarter were able to work on an angle (figure 11).

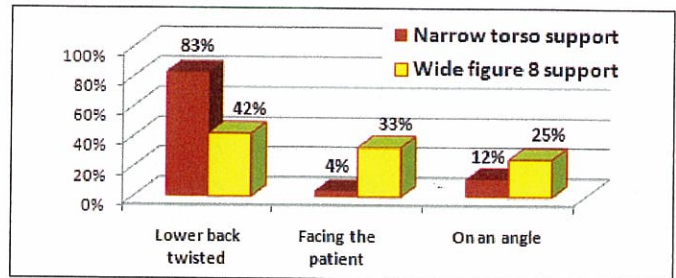


Figure 11. Percentage of assistants according to most common working positions with the old stool with "narrow torso support" compared to the new stool with "wide figure 8 support" (24 subjects).

With the narrow torso support, none of the assistants were able to place their legs far enough under the patient's chair. Only 17% of the assistants indicated that they were able to do so with the new stool. These data seem to indicate that many, but not all dentists have changed the height of the patient's seat back to allow the assistant to work facing the patient. In fact, 42% of the assistants were still working in a twisted back position.

9.2 Percentage of time spent working with arms supported

With the narrow torso support, 58% of the assistants were able to support their left elbow, but only one-third had support for their right elbow. With the wider figure 8 support, three-quarters of the assistants were able to support both elbows.

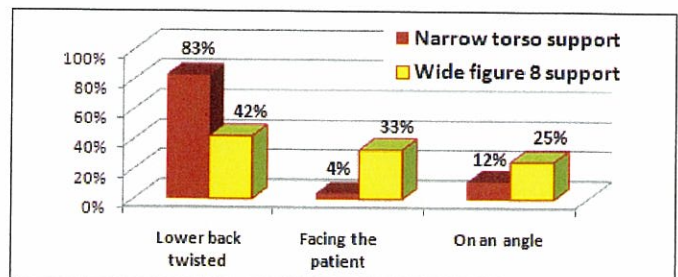


Figure 12. Percentage of assistants able to support their elbows *quite often* or *all the time* with the old stool with "narrow torso support" compared to the new stool with "wide figure 8 support" (24 subjects).

9.3 Percentage of time spent working in contact with the lumbar support

One-quarter of the stools with the narrow torso support are equipped with lumbar support, but only two of the assistants (8%) were able to rest their back on them. The lumbar support on the new stool is adjustable and moves forward, so 67% of the assistants were able to rest their back on it while performing dental procedures.

10. Comments by respondents

Most of the comments were positive. One of the respondents had had elbow surgery and another had had carpal tunnel surgery on both hands.

"I'm really happy with the chair (Posiflex 8). It's like day and night compared to my old stool. I have seen an improvement at every level, especially my work endurance, which is now 8/10 instead of 4/10." (H., age 52 with 32 years of experience).

"I had surgery in July 2006 for epicondylitis in my left elbow, after two years of therapy that didn't work. Now after the surgery and with the Posiflex stool, I have no more elbow pain. It's fantastic! This chair is very comfortable." (S., age 48 with 30 years of experience).

"I regularly had tendinitis in my shoulders and elbows. In the spring of 2008, I had carpal tunnel surgery on both hands. With the wider support bar and back support, my pain disappeared within a month. The pain in other parts of my torso has also diminished. The Posiflex stool has changed my practice." (É., age 38 with 15 years of experience).

"I haven't had any elbow pain since I started using the new stool. The chair is very comfortable and the armrest is wider and more comfortable." (L., age 65 with 37 years of experience).

"It's definitely a big improvement. There's no way I would go back to working with my old chair." (K. age 23 with 4 years of experience).

There were some issues raised relating to the size of the seat, the width of the elbow and torso support and the fact that with the new support, it was impossible for the assistant's legs to fit under the patient's seat back.

"Now I'm able to work facing the patient's head to protect my back, which was always twisted in the past. However, I'm still far from my work space. Ideally, I'd like to be able to slide my legs under the patient's chair, but this would not be the ideal position for the dentist." (F, age 40 with 15 years of experience).

11. Study summary

The purpose of developing this new "wide figure 8 elbows and torso support" was to reduce the static positions required to hold instruments accurately, without moving. With the wider support, three-quarters of the assistants were able to support both elbows. Lower back pain was significantly reduced (from 66% to 29%). However, while this chair was designed to work facing the patient, 42% of the assistants continued to work with their back twisted. It is therefore surprising that 91% still saw an improvement in their symptoms. The optimal forward facing position requires cooperation from the dentist, who could also benefit from this change in positioning the patient.

12. Advantages for the dentist in placing the patient in a higher, more horizontal position

The assistant's working position depends on the dentist's. Most dentists have learned to work with their arms at right angles (90°). However, this height makes them work with their neck bent forward (figure 13). For dentists, the work is extremely visually

demanding: steeply angled, limited space; areas that are hard to see; sharp instruments, turbines, etc. In general, there is less conflict between arm and neck position if the patient's chair is raised and the seat back is completely flat (figures 14 and 15).

In the early 1980s, Japanese dentists developed an approach known as "design by feel," which allowed dentists to work in safer positions (figure 15). These positions are also beneficial to the assistant, who can then position herself facing the patient. These positions are described in more detail in the ASSTSAS handbook *Prevention of Work-Related Musculoskeletal Disorders (MSDs) in Dental Clinics* (available freely on www.asstsas.qc.ca).

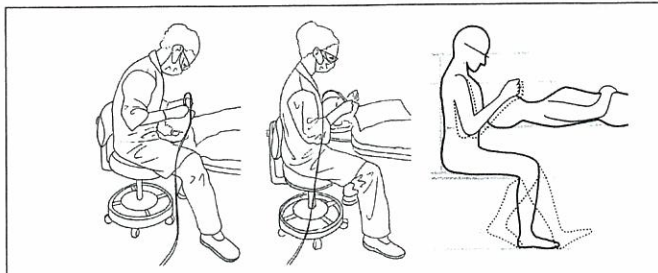


Figure 13. The dentist's neck and back are bent when the elbows are at 90° and the patient is low. The dentist has to bend his/her neck and back to reduce eye-to-task distance.

Figures 14 and 15*. When the patient's chair back is positioned higher and flatter, the dentist's neck and back are straighter. The arm angle is then about 60° and the eye-to-task distance is reduced. The dentist and assistant can both place their legs under the patient's seat back. The dentist's lower back is in contact with the lumbar support.

*Source: Adapted from BELENSKY (p. 287) and RUCKER (p. 197-203), American Public Health Association, 1998.

13. Cost and distributors

The Posiflex 8 assistant's stool with "wide figure 8 elbows and torso support" is available from several dental supply distributors, including Henry Schein Canada, Patterson, and Sinclair at a cost of \$1,350. Since May 2008, the wide figure 8 support is also available as an add-on, at a cost of \$535 (see figure 16). But first, the existing stool should be evaluated to ensure that it provides adequate lumbar support.

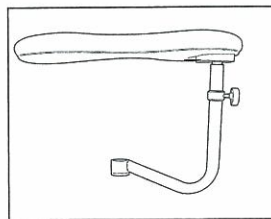


Figure 16. "Wide figure 8 elbows and torso support" which can replace the existing narrow torso support on an assistant's stool. The lumbar support should be adjustable and move forward so that the assistant can rest her lower back on it during dental procedures.

References / Références

(pour articles anglais et français • For French and English)

- BELENSKY, Michael M. *Human-Centered Ergonomics : Proprioceptive Pathway to Occupational Health and Peak Performance in Dental Practice*, dans Denise C. Murphy (sous la dir. de), *Ergonomics and the Dental Care Worker*, Washington, American Public Health Association, Chapter 11, 1998, p. 275-299.
- HARDAGE, Jack L., et al. "Clinical Work Posture for the Dentist : an Electromyographic Study, *Oral Health*", vol. 74, no 8, August 1984, p. 17-20.
- PROTEAU Rose-Ange, *Guide de prévention des troubles musculosquelettiques (TMS) en clinique dentaire*, ASSTSAS, 2007, 276 pages (Coût : 12 \$ par la poste ou gratuit sur internet) (www.asstsas.qc.ca/documentation/publications/GP50-tot.pdf)
- RUCKER, Lance M. *Surgical Magnification : Posture Maker or Posture Breaker ?* dans Denise C. Murphy (sous la dir. de), *Ergonomics and the Dental Care Worker*, Washington, American Public Health Association, Chap. 8, 1998, p. 191-216.

(pour article français)

- PROTEAU Rose-Ange, Denis MARCHAND, Christian PINSONNAULT et Annik CHAPADOS, *Diminution des contraintes musculo-squelettiques par l'utilisation d'appui-coudes mobiles en gel en clinique dentaire*, Compte rendu du congrès SELF-ACE 2001, vol. 5, p. 134-139 (www.asstsas.qc.ca/documentation/publications/self-ace01-rap2.pdf)

(for English article)

- PROTEAU, Rose-Ange. *Prevention of Work-Related Musculoskeletal Disorders (MSDs) in Dental Clinics* (Second Edition), 2008, 70 pages (www.asstsas.qc.ca/documentation/publications/GP50A-tot.pdf)
- PROTEAU, Rose-Ange. Reducing Musculoskeletal Strain with the Use of Movable Gel Elbow Rests in Dental Clinic, Proceeding of the SELF-ACE 2001 Conference, vol. 5, p. 134-139 (www.asstsas.qc.ca/documentation/publications/self-ace01-rap2a.pdf)

Written Examination Schedule for 2009 / Calendrier d'examen écrit pour 2009

The dates for the Clinical Practice Evaluation sessions for 2009 vary by location however they will run quarterly. Details are available on the NDAEB website www.ndaeb.ca

Exam Dates / Dates d'examen

1. March 28 mars 2009
2. June 27 juin 2009
3. September 26 septembre 2009
4. December 12 décembre 2009

Application Deadline Dates / Date limite de présentation des demandes

- * February 13 février 2009
- * May 15 mai 2009
- * August 14 août 2009
- * October 30 octobre 2009



* Applications for the written examination and the CPE must be received at the NDAEB office by 4:30 p.m. (Eastern Time) on the deadline date.

* Les demandes pour l'examen écrit et l'évaluation clinique doivent nous parvenir au plus tard 16h30 (heure de l'est), à la date limite indiquée.

For information concerning the Clinical Practice Evaluation schedule, please refer to the NDAEB website: www.ndaeb.ca or call 613-526-3424.

*Please note that the NDAEB does not have a toll-free phone number.

Pour plus de renseignements concernant l'horaire d'examen de pratique clinique, veuillez consulter le site web du BNEAD: www.ndaeb.ca ou appelez le 613-526-3424. *Veuillez noter que le BNEAD n'a pas de numéro de téléphone sans frais.