Ergonomics and the dental treatment room

The true definition of ergonomics, according to the International Ergonomics Association, is: the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. In essence, the interaction between man and machine. Derived from the Greek ergon (work) and nomos (laws) this roughly translates to the science of work.

The term ergonomics became a high-profile buzz-word of the seventies, but was typically used out of context, usually by an over exuberant furniture salesperson. More recently this discipline has gained considerable momentum within design circles, not least within the field of dentistry and dental equipment design. In fact, if you search the internet for “dental” and “ergonomics” you will be lead to The European Society of Dental Ergonomics – unfortunately, this site is under construction.

‘Ergonomics’ is today recognized and advocated by the many occupational health sites, as it is widely accepted that more work days are now lost due to minor injuries to the back sustained or aggravated in the working environment than to other ailments. With workplace/workspace design of such high importance to the blue-chips, why should it be any less important within the dental treatment room?

The Ideal

As important a topic as ergonomics is, its application in the dental environment is not always straightforward. For a start, typically dentists sit down to work, or at least while they are delivering dentistry. Dental assistants should also sit down too during the procedure – although unfortunately this is not always the case. Furthermore, the area of focus for this work is small, dark, wet and attached to a live and sometimes squirming human. The consequences of disrespecting the sensitivity of this focus area (the oral cavity) are enormous. When we consider what the UCLA Occupational Health Department website in the UK suggests for the prevention of Musculoskeletal Disorders (MSD), it is clear to see why there may be some confusion! According to UCLA, posture at work should be regarded as follows;

- Maintain erect position of back and neck with shoulders relaxed. Minimize twisting and bending motions. Position equipment and work tasks so that your body is directly in front of and close to your major work tasks.
- Use proper positioning during all activities. Keep upper arms close to the body, elbows at 100 degrees, forearms neutral (thumb toward ceiling), and wrist straight. Keep feet flat on the floor when seated by proper adjustment of your chair, or use of a footrest.
- Keep wrists as neutral as possible. Avoid extreme motions. There is a safe zone of movement for your wrist. This zone is about 15 degrees in all directions.
- Avoid bending neck forward for prolonged periods of time.
- Avoid static positions for prolonged periods. Muscles fatigue faster when they are held in one position. Keep moving to increase your blood circulation.

You will notice that each point probably conflicts with how you currently carry out most dental procedures, so I guess they weren’t thinking of the dental team when they wrote this!

At this point perhaps it would be prudent to consider the Pareto Principle – the 80/20 rule. In 1906, Italian economist Vilfredo Pareto created a mathematical formula to describe the unequal distribution of wealth in his country, observing that twenty percent of the people owned eighty percent of the wealth. Over the years this 80/20 theory has been developed and manipulated to be applicable to most working and management environments, with the principle that 20 percent of something is always responsible for 80 percent of the results.
It should be accepted that the dental team will not always be able to practice in the ergo-perfect position and that sometimes it would be optimum to suspend the patient from the ceiling to better access that upper-left seven! However, as this practice wouldn’t (or shouldn’t!) be tolerated, providing that around 80% of your time you can work comfortably, and the remaining 20% you at least know the risks; this work/comfort ratio is probably the best you can hope for given your chosen profession.

**Assess your comfort**
There are four significant areas of interest with regard to assessing the comfort of a working position and environment within the treatment room:

- Reach
  - If, during a procedure, you need to reach further than a class 3 movement (from the elbow) what you are reaching for is most likely in the wrong place.
- Repetition
  - Consider the repetitive actions you perform – is there another way? Could your technique maintain effectiveness with a slight modification or variation to your style, grip, stance or position?
- Loading
  - The amount of load, i.e. the weight of something you may be holding, or the effective load of your head and torso as it deviates away from the neutral/centered position. Another impact here is the amount of time this load is held.
- Lighting
  - With around 24,000 lux within the light pattern of a good quality dental operating light and, no more than 1,000 lux around the worktops within the typical treatment room, the opportunity for eye strain is huge.

**What Ails You…and how to address it?**

Discomfort in the lower back, neck, shoulders, fingers and wrists, headaches and eye strain, are all too common amongst the dental team. However, it is perfectly feasible to mitigate, and sometime even eliminate, all of these occupational-related ailments.

Several studies and practices can be looked into to help you and your team become more ergonomic in the work place;

- **The Five Ps.** Like any good project or system, remember the five Ps and success will prevail: **Previous Planning Prevents Poor Performance.** Take time out of your schedule to discuss issues as a team, and then take action based upon the outcomes, and your workplace environment should improve. Pay lip service and you may be reaching for the telephone number of the nearest chiropractor.

- **Tubs & Trays** Although many dental practices have adopted the tray system for the delivery of hand instruments to the work site, few have adopted the tub system. Tubs not only complete the planned approach to a procedure but they also ensure that all the relevant materials are within the reach of the assistant, therefore negating unnecessary reaching/stretching. This will enable the assistant to be permanently chair-side during the procedure, thereby more engaged and valuable to the smooth operation. Infection control issues are also addressed with this practice, as the requirement to rummage around in drawers with a potentially contaminated (gloved) hand is halted.
• **Four-handed Dentistry.** Proper placement and planning of the tub & tray system in conjunction with the procedures and days appointments will enable the assistant to pass instruments and materials to the dentist safely and efficiently. Paralleled with the practice of four-handed dentistry, this not only increases the engagement for the assistant but also minimizes, and in most cases eliminates, uncomfortable reach and unnecessary movement by the dentist (and assistant) during a procedure. It is important to note at this point that ergonomics and dental treatment room design is not meant to “pigeon-hole” the dentist in the corner of a room for the whole day – quite the contrary. The aim is to ensure that during a procedure the dental team is comfortable and efficient (remember the 80/20 ratio?). Once the procedure is complete it is recommended to move about and stretch, just as it is recommended to take a stretch-break during a long car journey.

• **Rapid Upper Limb Assessment (RULA).** Developed in 1993 by McAtammy & Corlett, Rapid Upper Limb Assessment (RULA) is a survey method developed for use in ergonomic investigations of workplaces where work related upper limb disorders are reported. RULA is a screening tool that assesses biomechanical and postural loading on the whole body with particular attention to the neck, trunk and upper limbs. Although studies have not yet been specifically conducted within the dental treatment room, reliability studies have been conducted using RULA on groups of computer users and sewing machine operators. A RULA assessment requires little time to complete and the scoring generates an action list which indicated the level of intervention required to reduce the risks of injury due to physical loading on the operator. RULA is intended to be used as part of a broader ergonomic study.

**How to…**
Yes, maintaining the correct posture is very important and no, it can’t always be that way in the dental treatment room. However, with the appropriate attention to design and the proper planning regarding preparation of the workspace prior to the procedure, you can achieve an acceptably ergonomic environment (80/20 again).

Most dentists replace their treatment room equipment every 10 to 15 years and therefore it could be argued they are not experts in this process/discipline. Most quality dental equipment specialists are involved with more than 30 dental treatment room refurbishments every year so
therefore you could argue that they are more experienced. Referral is almost always the optimum method of selecting a suitable business partner – learn from other’s experiences.

If you do not feel that ergonomic design is the highest priority with regard to the proposal on offer then question it. If you still feel a deficiency in this discipline then maybe it’s time to look elsewhere. Not all dental equipment manufacturers appreciate the importance and nuances of truly ergonomic dental treatment room design.

**Change is coming**
A famous business leader (Jack Welsh, CEO of GE) once said “change is coming and you should not be surprised when you are surprised”. Change is difficult but important and inevitable. Where practical change must be embraced, only change if you perceive a benefit and if that benefit is sustainable. Remember that if you always do what you’ve always done you will always get what you’ve always gotten (Americanism).

**Reference sites**

International Ergonomics Association: [www.iea.cc](http://www.iea.cc)

European Society of Dental Ergonomics: [www.esde.org](http://www.esde.org) (under construction)

Rapid Upper Limb Assessment Tool: [www.ergonomics.co.uk/Rula/Ergo/](http://www.ergonomics.co.uk/Rula/Ergo/)

UCLA Occupational Health Department: [www.ergonomics.ucla.edu/](http://www.ergonomics.ucla.edu/)

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