What can dentists learn from pilots?

Implant dentistry has followed a similar path to that taken by all major medical advances. Amalberti et al's[1] 2005 study, for example, speaks of an initial "innovative design." For the teams working in this field, this phase was characterized by both enthusiasm and skepticism.

It's easy to place oneself in the shoes of the first practitioners and researchers who began to glimpse something of this technique's incredible potential, but at the same time, one has to remember the extreme wariness exhibited by the majority of practitioners at this time. During this pioneering phase, progress was slow; there was an almost complete absence of prior practice to act as a guide. The practitioners who wanted to adopt this technique underwent extensive training.

Around the middle of the 1990s, dental implants began to become much more widely available in dental practice, and the second phase began, the "effective design." This was "the time of hope," characterized by numerous developments over a short period of time. Successive "innovations" were supposed to do away with complications. However, complications actually became more and more common, if only because of the increasing numbers of patients having dental implant procedures performed upon them. Under these circumstances, it was only natural to see such an increase in complications.

At the same time, iatrogenic complications also started to become more frequent. This occurred for two reasons: with the passage of time, it became clear that certain ideas and solutions that were initially seen as ingenious turned out to be anything but; secondly, more and more practitioners who had received minimal training in the technique began to place implants.

Confronted with an increase in the incidence of complications and failures, the remedies proposed remained firmly technical in nature. For instance, most dental practitioners and manufacturers of the relevant materials were convinced that biologic problems could be resolved through purely mechanical approaches, as evidenced by those who thought that the onset of peri-implantitis could be stopped by changing the implant shape.

Now, in 2019, we find ourselves faced with a paradox. Although our knowledge and expertise in the field of implant dentistry is more than sufficient to treat most patients successfully by means of relatively simple procedures, the number of complications continues to increase. This is a situation that patients, health insurance providers, the press, and regulatory authorities are less and less inclined to accept. In Japan a few years ago, recurrent problems linked to dental implants triggered a flurry of media reports that saw the number of such procedures carried out fall by 30% in the space of a few months. It's therefore high time for implant dentistry to pass as quickly as possible onto a third phase: "safe design."

Commercial aviation transitioned from phase 2 to phase 3 in the 1970s following a number of catastrophic accidents such as the Tenerife airport disaster. This cost the lives of 583 people due to a simple communication misunderstanding between the control tower and the crew of one of the airplanes involved. Studies of this accident have demonstrated that although the people involved were well trained, acted with the best of intentions and, above all, had absolutely no desire to die, they also possessed a number of attitudes that meant that it was ultimately impossible to avoid the errors that led to so many deaths.

The concept of Human Factors gradually gained currency in the aviation world. As a result, this field has become an ultra-safe environment over the past few years, rather like the nuclear industry. This concept is so useful that professionals who are trained to an incredibly high degree of technical proficiency (such as fighter pilots) also receive a great deal of training relating to Human Factors. Whilst all this was happening, dental practitioners persisted in believing that "platform switching" was going to help them solve all their problems relating to bone stability around implants – despite clear evidence that most bone loss around implants is linked to poor choices made

during the implementation of the course of treatment in question (implants were the wrong solution in the first place, the implants were placed too close together and/or their three-dimensional positioning was incorrect, they were a prosthetic misfit, there was excess cement in the subgingival area, poor force distribution, etc). They also ignored 5-year prospective studies which showed that the implant-abutment connection had no impact upon bone levels. This refusal to make changes to how they approached problem evaluation may be explained by cognitive biases such as confirmation bias. This leads us to only consider information that backs up our decisions and ways of thinking and leads to us reject all alternatives. The human brain is highly reluctant to leave its comfort zone.

However, although this topic is fascinating, it is not the real focus of this article. As pilots have been doing frequently over the last 40 years, dental practitioners will have to implement a real paradigm shift, starting by asking themselves not just "What is the problem?" but also "Why did this problem arise?" "Why?" – this interrogative adverb leads to a sea change in how we understand errors and complications.

Practitioners are usually familiar with the biomechanical and biologic laws and rules that are relevant in the field of implant dentistry. However, retrospective studies of procedures that have gone wrong reveal a failure to actually apply these rules. One highly fruitful avenue of exploration is to ask why practitioners decide to plough ahead with a course of action, despite being aware of the potential risks involved. This failure to apply the rules may result from deliberate negligence, in which case we can speak of a violation. However, bad decisions do not necessarily involve a conscious choice. Excess stress or workload, fatigue, poor communication between team members – all these factors can lead to incorrect decisions being made[2]. It is only by identifying behavioral risk factors and using "protective tools" like checklists, safer communication procedures, improving preparedness in the event of the unexpected with the "what if" concept, the sterile cockpit rule, and more, that practitioners will really be able to reduce the number of complications[3,4].

All studies carried out in the manufacturing sector, the field of aviation, and also in medicine show very clearly that 80% of complications are caused by human behavior. The medical field boasts a mountain of articles and books on this theme, describing in great detail the full range of tools and methods that can be used to make medical practice safer. Nurses have been applying the concept of Human Factors to their work for years. The results are striking and leave absolutely no room for doubt about the extent to which Human Factors boost safety in medical practice and reduce the cost of medical treatment. It seems as if dental practitioners are the last group of healthcare professionals to be still hesitating over these conclusions. How much longer will they continue to sit on the fence?

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