When a person dies unexpectedly, or in unusual or violent circumstances, in Australia it is generally the responsibility of forensic pathologists to establish the cause and mechanism of death. Sometimes the deceased person’s identity is not known, in which case identification can usually be resolved by comparing some form of ante-mortem record with post-mortem findings at autopsy. This can be done in various ways, such as fingerprint comparison. However, not all human remains are suitable for such comparisons. This may be because of post-mortem alteration of the body by putrefaction, burning or traumatic physical injury. In such circumstances the skeletal remains provide the most robust source of information. In life the teeth, being the only parts of the skeleton naturally exposed and visible, are more likely to have been documented in some way. Photographs of the living person may show them smiling, revealing the number, shape and arrangement of the front teeth, which may be sufficient to establish identity. The person’s treating dentist can furnish X-ray images of the teeth and jaws. These also provide information about past treatments, such as placement of fillings and other restorations. Fortunately, the teeth (and materials used by dentists to repair or replace them) are usually very resistant to breakdown. Teeth’s mineral component does not melt below 1600 °C—higher than the melting point of most metals. Further, as dental tissues are progressively subjected to increasing heat, the sub-microscopic apatite crystals, which provide teeth with their hardness in life, fuse by sintering, so that even after the complete combustion of any binding organic components of the teeth has occurred, their morphology and component tissues remain, albeit in a shrunken and friable state. Dentures or false teeth are made of metal or acrylic, both extremely resistant to chemical destruction. Although acrylic is vulnerable to burning, such dentures, protected at the expense of the oro-facial tissues enveloping them, frequently survive a fatal conflagration. Once a putative identity has been established, and because almost everyone in Australia has had a dental examination at some stage of their life, excellent records often exist for comparison with these most persistent and stable parts of the remains. The considerable recent success in preventing dental disease across the population has brought a paradox: as wealth and education increase and dental decay and extractions...
decline, appearance assumes a greater importance. The result is that more, rather than fewer, highly detailed dental records are generated. Many young people with no evidence of dental treatment in their mouths may still have had their dental status very carefully and comprehensively recorded somewhere. The problem is how to locate the corresponding ante-mortem records. Responsibility for this task lies with the police, but the odontologist can help interpret the records collected.

Also, the huge improvement in dental health as a result of fluoridation and other preventive measures is not universal. Disadvantaged people still carry an unacceptable burden of oral disease. Many live in difficult circumstances that result in vulnerability. Precautions are often omitted, with the result that dental health is compromised. Many young people with no evidence of dental treatment, which may require removal of some teeth and repositioning of others using a removable or fixed appliance. Such appliances, being handmade and unique to the wearer, may help identification. In addition, orthodontic examinations generate useful sources of information, such as X-rays of the whole head and plaster casts of the entire dentition. DNA analysis tells us nothing about the life of the deceased; with intelligent interpretation, much can be inferred about a person’s life from post-mortem dental findings, even without ante-mortem dental records.

For DNA comparisons, the consent of the mother or siblings to provide corresponding biological samples is often required. When a family is scattered between continents, this is difficult. Another option is to use personal items such as a comb or razor used only by the deceased in life. Again, finding pristine examples is not always easy: flatmates sometimes unwittingly use each other’s personal effects. There is also the matter of expense and time for analysis, both of which are greater than for the corresponding odontological comparisons. There are problems caused by fragmentation of remains. Expert physical matching of dissociated body parts by a trained anatomist, anthropologist or odontologist can greatly reduce the amount of DNA analysis needed, saving time and expense. Another problem is post-mortem tissue decay, which can make extraction of usable samples impossible. In cases where children need to be identified, the odontologist’s knowledge of the chronology of human tooth development can narrow the range of possible matches confronting the DNA expert, improve the statistical power of their calculations, and enable confident matching. Odontology and DNA are complementary techniques which together may succeed when either used alone might fail.