Transparent teeth: A powerful educational tool

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Since the early days of dentistry, dentists have explored the morphology of the internal root anatomy. From the pre-X-ray period to the technolo-

driven present, the study and exami-
nation of the root-canal system has become an obses-
sion for endo dentists. Several methods such as radiographic1 and histo-
gical examinations,2–5 cross-and longitudi-
nal sectioning, 4 and root-
clearing techniques, to name a few, were widely used in the past. Today, different computer-
ised tomography studies3 and observations under dental oper-
ating microscopes4 are performed to light up the dark confines of the dental pulp.

The tooth-clearing tech-
nique

Over the last 100 years, the tooth-clearing technique was utilised in human dental pulp morphology studies, as it pro-
vides a 3-D view of the pulp cham-
ber in relation to the exterior of the teeth and allows a thorough examination of the pulp cham-
cers and root canals.7–9 It was also utilised in the study of apical leakage.10 Today, the clearing technique remains useful only as a teaching and research tool, with little or no clinical applica-
tivity.11

In 1913, Hermann Prinz suc-
cessfully cleared teeth using the protocol proposed by Spaltholz in 1906.12 Okumura performed in-
depth studies of the pulp anatomy and classified the canals according to their distri-
bution and prevalence.15 In or-
der to simplify the canal system, he injected ink into the pulp cavity.15 Samples can also be stained with Haematoxylin and Eosin, which are largely used to colour histological preparations. Compared with other procedures such as radi-
ographic and histological exami-
nations, the tooth-clearing tech-
nique has the following advan-
tages:

- retains the original form of the root;
- enables the observation of minute details of the root-
canal morphology;
- is inexpensive;
- samples can be conserved for a long time; and
- is easy to perform.

The clearing process consists of three basic steps: demineralisation, dehydra-
tion and clearing of the root structure.14–15

Sample preparation

_Store extracted teeth in 10% formal saline until use._11
_Scale calculus and any remains of periodontal tissue._
_Decorate samples and negoti-
tiate canals with a #10 file (this will enhance acid penetra-
tion)._14
_Store samples in 4.2% NaOCl solution (the organic tissue re-
moval can be enhanced by placing the solution with the samples in the Ultrasonic Cleaner for 20 minutes)._15
_Wash under running water and dry._
_Indican ink can be drawn through the root-canal system by applying negative pressure to the apical end._
_Demineralisation
_Store samples in 5% nitric acid (HNO3) for three days._
_Change solution every eight hours._
_Metal or mechanical agitation promotes even demineralisa-
tion of the root._
_Wash samples under running water for four hours to clean._

Dehydration

_Dehydrate samples by using as-
cending grades of alcohol: 60
% ethanol for eight hours, 80%
ethanol for four hours, and
96.6% ethanol for two hours._
_Dry samples with paper towels._

Clearing

_The sample should be placed in xylene for two hours to harden prior to placing the samples in methyl salicylate to render them transparent._16 (This step is essential if samples are going to be used for practising instru-
mentation or obturation tech-
niques.)
_Store samples in methyl salicy-
late in order to preserve their transparency._

Please note: Always use proper protection when han-
dling these dangerous solutions. Disposal of the used solutions should be done according to country regulations.

_Educational tool

Successful root-canal treat-
ment depends on adequate cleaning, shaping and filling of the root-canal system. However, in order to achieve this goal, it is imperative that the operator has a detailed knowl-
dge - ledge of the root-canal morphology of each individual tooth that is treated. Deminer-
alised and cleared teeth may become a very valuable aid in the teaching of endodontic techniques. Hasselgren and Tronstad17 used cleared teeth to teach and practise instrumentation and obturation procedures in a preclinical course at Lund University, Sweden. At the end of the course, the students were asked to give their opinions re-
garding the use of the transpar-
ent teeth in the learning process. The reaction was very favourable and encouraged the head of the department to extend the use of cleared teeth in follow-
ing courses.17

In summary, this simple and inexpensive technique will en-
able dentists to visualise the root-
canal morphology in detail while allowing them to practise almost every endodontic procedure de-
sired._

Editorial note: A list of refer-
ces is available from the pub-
isher.
“Being a pioneer in innovation” – that’s not only the motivation of AmannGirrbach but also of the Antonine University in Beirut as Father Antoine Rajeh, President of the Antonine University, pointed out in his inaugural address at the opening of the “AG training center” on 22 of October in Beirut. The long guest list including ambassadors, agents, presidents of the syndicate, directors, dealers, trade unionists and students left no doubt that this important event was a tremendous step for the Antonine University and moreover for the future of the dental industry in the Middle East.

AmannGirrbach is one of the leading companies in the dental sector. The company, which arose out of the merger of the companies Amann and Girrbach Dental, is based in Pforzheim, Germany, and Koblach, Austria with an independent company in Tampa, in the USA.

The University’s CAD/CAM chair now functions concurrently as an official training center of AmannGirrbach. True to the motto “imparting knowledge, creating knowledge” and as an absolutely unique aspect the project combines business and science. Students of the Antonine University and participants of AG trainings will take technical and business knowledge, knowledge that they will have experienced live, discovered for themselves and learnt intensively.

Provided with updated products of Amann Girrbach, the training center offers 10 working stations, ideal conditions for training sessions, exchanging knowledge and learning more about dental technology.

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