Visibility Insight In Endodontics

Dr. Neelam D. Chandwani
Asst. Professor
Dept. of Conservative Dentistry & Endodontics
V.Y.W.S Dental College & Hospital, Amravati.

Dr. Prachi Sontakke
MDS, Conservative

Dr. Pankaj M. Bajaj
Dental Surgeon

Dr. Anand A. Tripathi
Asst. Professor
Dept. of Orthodontics
V.Y.W.S Dental College & Hospital, Amravati

"Vision without action is a day dream. Action without vision is a nightmare, action with Vision is making a positive difference".

All possible efforts have been made to culminate in precision & perfection of the care rendered & achieve a predictable success by developing new materials, techniques and technology.[1] Different methods we use to visualize the operating field include, isolation, illu-mination, conventional radiographs, RVGs, endograms, CT scan, magnifying lenses, loupes , endoscopes, orascope and so on. But none of these have been proved to be completely acceptable & feasible in routine clinical practice. Magnification of the operating area has long been a subject of research, and led to the development of magnifying loupes[2], telescopes and surgical operating microscope. Microscope can be defined as an optical instrument that uses a series of lenses to produce magnified images of small objects specially those not seen with the unaided eye.

History of Surgical Operating Microscope

1. In 1922, Carl Nylen an otorhino-laryngologist operated on labyrinthine fistulas rabbits.
2. In 1975 Buamman's article suggested its possible applications application in dentistry.
3. In 1981 Apotheker suggested uses in Endodontics

Our field has changed fundamentally in the last few years following the introduction of Surgical Operating Microscope. SOM has eliminated a lot of guess work which existed earlier. Modern day SOM is the pinnacle of technology which not only provides variable magnification but also has facilities like adjustable co axial illumination, light filtration, screen display, co observation, video recording, photography and many more.[1] This article is an attempt to give a clinical insight into physics of microscope and the advantages of using SOM in routine endodontic treatment.

Parts of the Surgical Microscope [1]

1. Base mounting and Body.
2. Those focusing on the part of the oral cavity- (i) Mounting systems.
3. Those focusing on the operating site- (i) Binocular tubes, (ii) Eye piece, (iii) Objective lens, (iv) Illumination systems.
4. Those that aid in fine focusing the part of the operating microscope- (i) Magnification changer.
5. Microscope accessories- (i) Beam Splitter, (ii) Photo adapter, (iii) 35mm still camera, (iv) Television camera, (v) Video camera, (vi) monocular/ binocular viewing tube.

Optics of the Surgical Microscope [1]

1. Present day microscopes are stereo microscopes with Galilean optics.
2. Galilean optics focus at infinity and send parallel beams of light to each eye and are also referred as infinity corrected optics.
3. It permits relaxed viewing with minimum eye strain and fatigue.
4. Allows the clinician to see the depth of field.

Magnification

It is determined by (1) Power of eye piece, (2) Focal length of binoculars, (3) Magnification change factor, (4) Focal length of operative lens.

Eyepieces are generally available in the powers of 6.3 X, 10X, 16 X and 20 X.

The following should be taken into consideration- (1) Increase in the focal length of the objective lens the magnification decreases and the field of view increases and illumination decreases. (2) Increase in the focal length of binoculars increases the magnification and decreases the field of view. (3) As the magnification factor increases field of view decreases and magnification increases. (4) As the power of eye piece increases magnification increases and the field of view decreases.

A typical microscope package could be one with 12.5X eyepieces, 125 mm straight or inclinable tube binoculars, a power zoom magnification changer, and an objective lens of 200 mm. This would allow a clinician to operate comfortably about 8 inches from the patient and in the magnification range of about 3X to 26X. The power zoom feature would allow a smooth zoom with 8:1 ratio.

Illumination

Two light sources are commonly available- xenon halogen bulb and quartz halogen bulb. A fan cooled xenon halogen bulb is recommended because it is brighter and warmer. The most important feature is co-axial illumination with the line of sight. This means that light is focused between the eye pieces in such a fashion that the clinician can look with both the eyes into the surgical site without seeing any shadows. This is made possible by the use of Galilean optics. This optic focus at infinity and send parallel beams of light to each eye so operator's eyes are at rest as though he/ she were looking off into the distance which prevented eye fatigue.

Documentation

It involves the beam splitter which provides illumination for photographic and video documentation, can be connected to photo and cine adaptors. The function of these adaptors is to attach 35mm and video cameras to the beam splitter. photo and cine adaptors also provide the necessary focal length so that the cameras record an image with the same magnification and field of view as seen by the operator.

Applications in Endodontics

Endodontic microscopy and its implications can be categorized into-

(1) Diagnosis, (2) Accurate, precise & conservative treatment, (3) Evaluation of the treatment rendered, (4) Follow ups & need of replacements, (5) Study of failures, (6) Legal record, (7) Video recording, photography, screen display, (8) Educational, (9) Case presentation Documentation & discussion, (10) Great Ergonomics convenience, (11) Patient Satisfaction, (12) Referral Needs.

Diagnosis

The capability of superior vision helps in the search of missed or extra canals[3], fracture lines, perforations, ledges, calcified canals. separated instrument in the canal .

Non Surgical Endodontics [4,5]

A major portion of microscope use is in non surgical endodontics. The microscopes can be an aid in modern endodontic practice because it provides the capability to see and fully evaluate the chamber and canals. The microscope helps immensely in location and treatment of missed/ extra canals, calcified canals, retrieval of broken instruments, repair of perforations, bypassing ledges, retreatment cases, post removal.

The best way to manage complication is to prevent complication. And the best way to avoid these pitfalls is to be able to see. Microscope offers the most excellent visualization thus eliminating guess work in endodontic treatment.

Surgical Endodontics

It was the first area in which microscope was used. For the first time dentist could truly visualize root end anatomy and understand why surgery failed. Magnification ,illumination and instruments constitute a microsurgery triad. The main advantages of the microsurgical approach are- (1) Small osteotomies, (2) Shallow bevels(less than 10 degree) this conserves cortical bone and root structure, (3) Discovery and treatment of isthmuses, (4) Together with the microscope the ultrasonic instrument permits conservative, co axial root end preparations and precise retro fills satisfying all the requirements for mechanical and biologic aspects.

Documentation and Patient Education

All microscope companies have units that have the capability to videotape procedure and to reproduce video prints. The videotape is a great source of demonstrating to the patient what surgical procedures were performed.

The video tape and the video print are the good sources to compare with recall x-rays. This documentation capability gives more complete information that can later be compared to straight recall x-rays and clinical examination. Also for those cases with a questionable prognosis, the dentist has more proof of what the tooth actually look like. Therefore the microscope is not merely a clinical tool but a total asset to the clinical practice.

Maintenance of the Surgical Microscope

- Storage area should not be remote from the operating area.
- Prevent from dust by covering, dust cap should always be placed when not in use.
- Microscope optics should be covered with lint free cloth or plastic bag during storage.
- Immediately after surgery, bone fragments, blood should be removed with soft cloth soaked in surface active luke warm detergent.
- Spare bulbs should always be available.
- Do not bend the fiber optic cables too sharply

Infection Control

- Drape the microscope with a sterile, disposable, clear plastic material.
- Foot pedals are also draped in clear plastic.
- Place moulded sterilizable plastic or rubber cups on all microscope knobs.
- Objective lens is covered with sterilizable objective shell.
- Microscope manufacturers have recommended not to use autoclave, vapor or gas for sterilization.

The Future

1. Improved reliability and more precise controls.
2. Voice control of focus, zoom and field location.
3. Allowing manipulation of instrument while viewing through a video screen with clarity and magnification .

Conclusion

Introduction of SOM in clinical dental practice is a quantum leap towards achieving perfection in all clinical procedures. It not only provides magnification but a plethora of facilities which make it a million dollar equipment. Gone are the days when endodontic therapy was regarded absolutely blind procedure. It can now be practiced as a microsurgical procedure[6] which it actually is.

References

References are available on request at **editor@healtalkht.com**

Address for Correspondence
Dr. Neelam D. Chandwani C/o Smilecare Dental Clinic, T-3 Godavari Sankul, K.T. Nagar, Katol Road, Nagpur-13. drneelam_bajaj@hotmail.com