MATERIALS AND METHODS

MATERIALS:

- 60 mandibular premolar teeth
- Hyflex EDM rotary instrument system.
- 5% NaOCl
- 17% EDTA
- normal saline
- 27 gauze leur-lock syringe.
- ISO size 30 paper points
- AH Plus sealer
- Lentulo spiral.
- Master cone
- Rhodamine B fluorescent dye to an approximate concentration of 0.1%
- Gutta-Percha points.
- Thermafil obturators
- Guttaflow syringe
- C- Points
- moist gauze.
- Confocal Laser Scanning Microscopy (CLSM) (carl zeiss, GERMANY)
METHODOLOGY:

This study will be conducted at the Department of Conservative Dentistry & Endodontics, Rama Dental College and research center, Rama University, Kanpur.

Before the study, permission will be taken from the institution ethical committee.

Sixty freshly extracted single rooted human mandibular premolar teeth are selected for this study on the basis of these criteria, no root caries, resorption or fracture; mature and completely formed apices, single rooted and radiographically confirmed single canal. The selected samples are decoronated at twelve millimeter from the apex for standardization with a low-speed diamond disc under continuous water spray. Chemo-mechanical debridement of the root canal is done by removal of pulp and canal patency will be maintained by passing with an ISO size 15 K-file. The working length is established by reducing 0.5 mm from the radiographic apex. Instrumentation is performed with a crown down technique using Hyflex EDM rotary instrument system. All canals are prepared to ISO size 30. The canal is irrigated between each instrument with 2 ml 5% NaOCl for 1 minute and final flush of 2 ml 17% EDTA (pH7.7) is done for 3 minute. Finally, the canals are washed with 2 ml of normal saline with 27 gauze leur-lock syringe. After completion of instrumentation, the root canals are dried with ISO size 30 paper points and checked for patency.

The prepared teeth are randomly divided into 4 groups of 25 samples each.

The canals are dried with paper points and coated with AH Plus sealer using lentulo spiral. Master cone is selected, checked for tug back and coated with sealer which is mixed with Rhodamine B fluorescent dye to an approximate concentration of 0.1%, and placed in the canal. All the specimens are obturated with conventional gutta-percha, Thermafil obturators and Guttaflow syringe according to manufacturer instructions.

After the completion of obturation all the teeth are wrapped with moist gauze to maintain the relative humidity at 37°C for 48 hrs for the proper setting of the sealer. The specimens are transversely sectioned at the mid-point of the coronal, middle and apical third of each root.

DIFFERENT PARAMETERS OF OBTURATION
Electrochemical Methods
Dye penetration Methods
Periapical Radiographs
CBCT
Dye Leakage Study under Scanning Electron Microscope
Energy Disperseive Spectrometry Microanalysis
Sample size has been calculated in order to control type I & type II error. Assuming a minimum power 80% and 95% significance level, the sample size has been calculated using this formula:

\[ n = \frac{2\sigma^2 (Z_{\beta} + Z_{\alpha/2})^2}{\text{difference}^2} \]

- **Sample size** in each group (assumes equal sized groups)
- **Standard deviation** of the outcome variable
- **Effect Size** (the difference in means)
- **Represents the desired power** (typically .84 for 80% power)
- **Represents the desired level of statistical significance** (typically 1.96)

The calculated sample size for each material was 15; however, in order to increase the confidence and power of my study, I shall be targeting a sample size of 25 for each material.

*The data obtained will be subjected to statistical analysis.*
**SCOPE AND LIMITATION**

The better sealing ability of root canal filling materials is advocated because micro leakage between root canal filling and root canal walls may adversely affect the results of root canal treatment. Therefore, complete obturation of the root canal with a good obturating material and creation of an apical seal have been proposed as goals for successful endodontic treatment.

The main advantages of Thermafil technique are it gives three dimensional obturation with minimal taper that can fill complex root canal anatomy, irregularities of intracanal anatomy. The disadvantages noticed were risk of extrusion of gutta-percha, difficulty in retrieval of gutta-percha during post space preparation and retreatment and difficult to use in canals with bi-or-tri-furcation or open apex.

The main advantages of Guttaflow technique are it gives excellent flow properties, good biocompatibility, allows ease of post space preparation, permits easy removal of gutta-percha during retreatment, gives fluid tight seal and as is radiopaque. On contrary, it has a high risk of void formation and chances of overfilling and under filling are there.

The C-point system (Pro-point, EndoTechnologies, LLC, Shrewsbury, MA, USA) is a point-and-paste root canal filling technique that consists of pre-made, hydrophilic endodontic points and an accompanying sealer. C-points have a two-component design, a central core to provide good handling characteristics and a hydrophilic polymer coating, which radially expands to seal the canal. When hydrated in the root canal, C-points expand, conforming to canal irregularities and pressing the companion hydrophilic sealer, HySeal-bio, into concavities, lateral portals of exit and the tubules of the dentin walls.

**UTILITY**

If the hypothesis is proved, the concept of new non-invasive warm and cold gutta-percha techniques will be adapted to endodontics for better sealing ability of root canals in comparison to standard lateral compaction technique.