# O'Neill Classification for Eustachian Tube Dysfunction and Middle Ear Barotrauma
## A Grading System for Clinical Hyperbaric Oxygen Patients

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## BACKGROUND

- Eustachian tube dysfunction (ETD) and middle ear barotrauma (MEB) are the most common complications of clinical hyperbaric oxygen therapy ($HBO_2T$) with an incidence reported from 2% to 91%.
- Classification of trauma to the tympanic membrane (TM) was first described in 1944 by Navy Lieutenant Commander R. W. Teed (Teed Classification) to evaluate young Navy submariners.
- This classification system is antiquated, subjective, and of little clinical value in modern hyperbaric practice.
- Written results from a baseline otoscopic exam "Normal TM" is not descriptive or adequate to describe baseline variations in anatomy causing inconsistent diagnosis
- Future exams have no otoscopic baseline for comparison in a symptomatic patient during or post compression making it impossible to objectively determine a proper grade.
- Subjective exams in symptomatic patients may wrongly dictate a need for further medical or surgical intervention or delay necessary hyperbaric treatment.

## PURPOSE

Develop a new grading system for the evaluation of the tympanic membrane in clinical hyperbaric patients that will:

- Record and document the anatomical condition of the TM prior to compression in a hyperbaric chamber.
- Be used as an objective reference for all members of the hyperbaric team when reevaluation of the TM is necessary.
- Create a grading system that is simple, easy to use by all hyperbaric team members regardless of their level of training.
- Adequately addresses the trauma inflicted to the TM and describes the appropriate course of action to correct the root cause or treat the trauma inflicted.
- Avoid unnecessary medical and surgical treatment caused by inconsistent classification of the extent of TM trauma using the Teed scale.

## PROPOSED GRADING SYSTEM BY O'NEILL

**** Baseline evaluation of the Tympanic Membrane prior to pressure exposure must be photo documented for future comparison by other team members and appropriate assignment of an O'Neill Grade ™ ****

Baseline photos demonstrating normal TM anatomical variations and the need for objective documentation


### O'Neill Grades Defined

**Grade 0 Eustachian Tube Dysfunction**
- *Baseline* photo depicting anatomical appearance of the TM before pressure
- Symptoms with no anatomical change (no trauma) from *baseline*

**Grade 1 Barotrauma**
- Erythema increased from *baseline*
- Fluid or air trapping (visible bubbles) in the middle ear space

**Grade 2 Barotrauma**
- Any bleeding noted within the tympanic membrane or middle ear space
- Perforation

### Suggested Intervention/Treatment

**Grade 0**
- Enhanced patient teaching/equalization
- Slow/non-linear compression rate
- Same as above and consider medical therapy

**Grade 1**
- Enhanced patient teaching/equalization
- Slow/non-linear compression rate
- Consider medical therapy / myringotomy tubes

**Grade 2**
- ENT Referral
- Hold treatments until Tympanic Membrane returns to *baseline*

## METHODS

- A Welsh Allyn® Digital Macroview Otoscope was used to record the objective photo baseline of the TM's bilaterally for future comparison.
- Video of the patients ability to equalize middle ear pressure was also documented to determine risk in future analysis.
- Any patient with middle ear complaints or discomfort during pressurization was re-photographed post treatment.
- An O'Neill Grade ™ was then assigned based on a comparison to the baseline photo.
- Intervention / treatment as suggested by the O'Neill Grading System™ was then applied.
- Grading was simple and consistent among all team members as was the suggested treatment that followed.

## CONCLUSION

A new and objective classification system for evaluating the TM of clinical hyperbaric patients is described. The system is simple employing the use of an inexpensive video otoscope that obtains objective data, both photo and video, for future reference. It avoids inconsistencies seen with Teed grading. The O'Neill Grading System™ is comprised of three simple grades, each of which has corresponding treatment suggestions.

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