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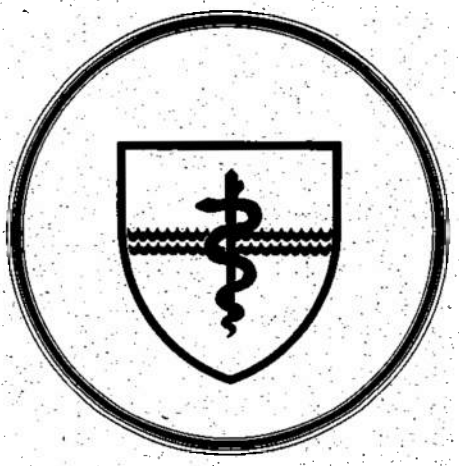

REPORT NUMBER 1048

CONTACT LENSES ON SUBMARINES

by

James F. Socks

Naval Medical Research and Development Command
Research Work Unit M0100.001-1023

Released by:

William C. Milroy, CAPT, MC, USN
Commanding Officer
Naval Submarine Medical Research Laboratory

29 April 1985

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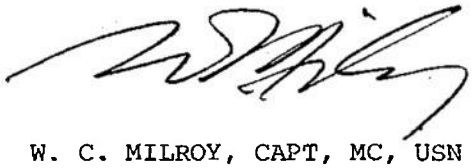

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SUMMARY PAGE

PROBLEM

To determine the feasibility of wearing contact lenses aboard submarines to correct the refractive errors of periscope operators.

FINDINGS

A total of 174 submariners (154 officers and 20 enlisted) were fitted with contact lenses and the acceptability of the lenses monitored. The periscope operators were extremely enthusiastic about wearing the contact lenses on submarines. They reported improved vision, increased field of view, and fewer visual problems when using the periscope.

APPLICATION

Extended wear contact lenses have been shown to be safe for use on submarines for long periods of time and to provide improved visual performance for periscope operators. Consideration can now be given to relaxing the spherical refractive error standards for nuclear power officers aboard submarines to the level now set for unrestricted line surface vision standards.

ADMINISTRATIVE INFORMATION

This research was carried out under Naval Medical Research and Development Command Work Unit M0100.001-1023 -"Enhanced visual performance on submarines." It was submitted for review on 4 April 1985, approved for release on 29 April 1985 and designated as NSMRL Rep. No. 1048.

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ABSTRACT

In order to determine the feasibility of using contact lenses to correct the refractive errors of periscope operators, 174 operators (154 officers and 20 enlisted men) were fitted with contact lenses and their acceptability aboard submarines monitored. Extended wear contact lenses were shown to be safe for use on submarines for long periods of time and to provide improved visual performance. Corneal complications were usually minor and transitory. They included striae, infiltrates, epithelial staining and pits, and neovascularization.

A surfactant type lens cleaner was often combined with an enzyme cleaner for maximum lens cleaning. Cold chemical disinfection was used except for those subjects exhibiting solution sensitivity; those were placed on unpreserved saline or hydrogen peroxide regimen. Lenses were replaced primarily due to tearing and deposit build-up.

It is recommended that contact lenses be considered as an alternative to spectacles for periscope operators, and for others whose visual performance is hindered by wearing spectacles. For successful contact lens wearers, consideration should be given to making the submarine spherical refractive error standard for unrestricted line officers the same as those for unrestricted line surface. Should this be done, a back-up to the contact lenses such as the periscope eyepiece modification should be available.

INTRODUCTION

The use of optical systems designed to interface with the human eye presents a number of problems. These are particularly acute for those individuals who must use these devices while wearing spectacles. Naval Officers serving in the submarine service who wear eyeglasses often have difficulty seeing clearly through the periscope as well as seeing certain control room indicators; they must constantly doff and don their glasses. Historically the number of officers serving aboard submarines who wore glasses was very small; however, in recent years, as the demand for more submarine officers with higher educational backgrounds has increased, the number of officer candidates who require glasses has also increased. As a result, there has been a general relaxation of visual acuity and refractive error standards. Even so, the vision requirements have to some extent held down the number of officer accessions.

Ideally, the maximum refractive error should be no greater than that which is correctable using the dioptric adjustment on the periscope. In actuality, this has not occurred in the Submarine Service in recent years. Setting the visual acuity/refractive error standards to that criterion would be so restrictive as to result in a significant shortfall of officers in the submarine service. The current refractive error standard allows for entrance into the Submarine Service with a spherical equivalent refractive error of +/- 5.50 diopters and 2.00 diopters astigmatism (1).

There is a second problem. Many officers serving on submarines initially met entrance standards when they began serving; however, their eyes have changed so that they are no longer qualified. This is not unusual for an individual who is a young myope (nearsighted). Myopia will often continue to increase with age. Studies of submariners have shown that their vision decreases with time (2) and is poorer than that of a matched population (3). A survey of 23 submarine crews revealed 210 officers and quartermasters who wore glasses full time , and 36, or 17%, whose refractive errors approached or exceeded the current refractive error standard (4). These officers either were at the limits of the visual standards at the time they entered the Navy or received vision waivers as being slightly over the standard. Now that their myopia has increased, they would no longer be qualified for admission to submarine duty.

An additional factor is that there are those who meet the standards and should presumably see well with one type

of periscope, but do not see clearly through another. For instance, the Type 15 periscope has a dioptric range of approximately +3.50 to -3.50, and the Type 18 has a range of around +4.50 to -4.50. No correction for astigmatism is available on the periscopes. In the case of an officer whose refractive error is -5.50 diopters, he would see clearly through the Type 18 periscope with the eyepiece "at the stop." However, if that same officer were to serve aboard a submarine having a Type 15 periscope, he would be 2.00 diopters under-corrected even with the eyepiece at the stop. This individual's visual acuity would then be around 20/200 (5). If that person had, in addition, the maximum allowable amount of astigmatism (2.00 D.), then his visual acuity would, of course, be much worse.

The Naval Recruiting Command has estimated that 10-15% of otherwise qualified officers are rejected as not eligible for submarine service on the grounds of not meeting vision standards (6). This amounts to around 45 officers each year. It is clearly becoming increasingly necessary to find a solution to the problem.

One solution would be to expand the limits of adjustment of the periscope optics. This, however, would be quite expensive even for the spherical adjustment, and for the cylindrical corrections which most men also require, it would be completely unfeasible. Another solution is to modify the periscope eyepiece so that the operator's refractive correction can be inserted (7). This is quite feasible and is an attractive solution, but it has the drawback that when the operator looks away from the periscope back at the control room, he does not have his glasses on and may be unable to see clearly.

A third solution is to fit all periscope operators with contact lenses. This also has some conceivable drawbacks. A certain percentage of individuals cannot wear contact lenses; some individuals can wear them under ordinary circumstances but experience an unacceptable level of irritation on submarines. The purpose of this investigation as requested by the Deputy Chief of Naval Operations for Submarine Warfare (8), was to assess feasibility of utilizing contact lenses on submarines as a method of vision correction, and to evaluate concerns relating to the wearing of contact lenses as raised by the Navy Surgeon General (9).

METHOD

Subjects

Officers and quartermasters serving aboard submarines home ported in the Groton-New London, Connecticut area were asked to volunteer to be subjects in the study.

One hundred seventy-four officer and enlisted submariners were fitted with contact lenses during the time period of the study from December 1981 to August 1984. One hundred fifty-four of the subjects were officers and twenty were enlisted (quartermasters and other qualified periscope operators). An additional four men began wearing contact lenses, but were dropped due to inability to obtain a proper fit (2 subjects), or transfer out of the area shortly after being admitted to the study.

Fitting of lenses

During the initial visit, subjects received a complete visual examination including measurement of corrected and uncorrected visual acuity, evaluation of extra-ocular muscle function, refraction, and ocular health examination including pupillary reflexes, ophthalmoscopy, and biomicroscopy. Abnormal findings on the slit-lamp examination (biomicroscopy) of the anterior segment were photographed as necessary. Visual examination was followed by contact lens fitting. All subjects were fitted with spherical or toric extended wear lenses. The lenses selected for use in the study were the two lenses approved by the Food and Drug Administration for extended wear at the time the study began. These were bufilcon A (55% water) and perfilcon A (71% water). No other lenses were added during the time of the study.

During the dispensing of the lenses, subjects were taught lens insertion, removal, and lens care. Subjects were instructed to wear their lenses for a week on a daily wear basis taking the lenses out at night before commencing extended wear in order to develop some facility in handling their lenses.

Follow-up examinations usually consisted of visual acuity through the contact lenses, over-refraction, slit-lamp, and fit evaluation.

Once subjects began extended-wear, follow-up visits were scheduled the morning following first night of sleeping with the lenses, 3 days thereafter, 1 week later, two weeks, 1 month, three months, and every six months thereafter.

RESULTS

Distributions of Refractive Errors

Of the men who wore spectacles, 31.8% of their eyes had only spherical refractive errors. Of the men who also had cylindrical refractive errors (astigmatism), 45.1% had astigmatism ranging from .25 to .75 diopters, 20.6% had

astigmatism of 1.00 to 1.75 diopters, and 2.5% of the men had astigmatism above 2.00 diopters.

Figure 1 shows a detailed breakdown of the spectacle corrections. For example, a total of three men had spherical errors less than 1.00 diopter. Eight had cylindrical errors which were .75 diopter or less, fourteen had cylindrical errors between 1.00 and 1.75 diopters, and six had cylindrical errors equal or greater than 2.00 diopters. Nine of the subjects were hyperopic (far-sighted) with corrections ranging from +.25 to +6.75 diopters.

Figure 2 gives a grouped distribution of spherical contact lens corrections that were fitted, and provides a breakdown of the distribution of cylindrical contact lens corrections for each of the grouped spherical powers. The spherical corrections ranged from + 5.75 to -8.25 diopters with the largest group between 2 and 3 diopters. Thirty-two lenses had cylinder powers of -1.25 diopters, and eleven were lenses of -2.00 diopters of cylinder.

Replacement of lenses

Lenses were replaced for four reasons. Some became torn, some developed deposits which could not be removed by cleaning, some were lost, and some did not fit properly or possibly changed shape due to handling. There were 40 lenses which were replaced due to tearing, whereas only 14 lenses were replaced due to deposits. It has been proposed (10) that drying of the lens surface enhances lipid deposition. A total of 29 lenses were lost for reasons varying from spontaneously falling out to swimming underwater with the eyes open.

Extended wear/Daily wear

Of the subjects, 126 were on extended wear and 35 were on daily wear. Some were on daily wear were due to inability to achieve satisfactory extended wear prior to transfer and some due to poor motivation to sleep with lenses.

Visual acuity with Contact Lenses

Of the 148 subjects wearing spherical lenses, all but two had 20/20 or better visual acuity in at least one eye, and 20/25 in the other eye. One other subject had 20/20 in the better eye and 20/30 in the other eye, and one subject had less than 20/20 in both eyes. A total of 51 eyes wore toric lenses to correct for astigmatism. Thirty-nine eyes obtained 20/20 visual acuity, nine eyes 20/25, two eyes 20/30, and one eye 20/40. Only two subjects wearing toric lenses bilaterally failed to achieve 20/20 visual acuity in at least one of the eyes.

Complications

Note was taken of any abnormal physical or physiological change to the cornea. These included corneal staining, stippling, striae, infiltrates, neovascularization, corneal pits, and solution hypersensitivity.

Based upon this broad definition of complications, there were 42 cases; however, most of these were minor including 8 cases of mild corneal staining and 14 cases of corneal "pits" or indentations due to bubbles under the lenses. Fifteen subjects exhibited corneal striae, four exhibited infiltrates, and nine exhibited minor neovascularization.

Solution sensitivity, while not a direct effect of the lenses, is included here and amounted to 8% of the wearers. The most frequent problem was a delayed hypersensitivity to thimerosal although two subjects were allergic to papain (11).

DISCUSSION

Degree of Acceptance

Periscope operators are over-whelmingly enthusiastic about contact lenses on submarines. They report improved vision and increased field of view. They can leave the periscope focus at zero permitting other operators to use the periscope without changing the eyepiece focus, and can quickly look from the periscope to control room indicators and back without having to constantly don and doff their glasses. Contact lens wearers who wear the emergency air breathing mask do not suffer from leaks under the mask or degraded vision as reported by spectacle wearers (12,13). Bridge watch standers are no longer bothered by fogging of glasses due to sea spray and rain. Commanding officers using extended wear lenses report increased convenience of reading control repeaters located in the stateroom when awakening from sleep.

Complications

The incidence of complications from contact lenses during this study was very small.

Corneal striae were frequently seen shortly after the subject began extended wear although they occasionally appeared during daily wear. In most cases the striae disappeared over time even with continued extended wear. When striae persisted or increased in number, the subjects

were instructed to alternate extended wear with daily wear.

Corneal staining usually varied from mild to moderate with a few incidences of severe staining. In most of the cases, the etiology was due to exogenous irritants such as dust or contact lens solutions. In one study, 75% of the non-contact lens wearers exhibited corneal staining (14).

A number of patients exhibited solution sensitivity. They were either switched to unpreserved saline or saline preserved with potassium sorbate. Contact lens solutions have been strongly implicated in keratitis (15), as well as other ocular reactions including burning, itching, redness, and infiltrates as mentioned (16). It has been suggested that these reactions be divided into toxic and allergic reactions (17).

Lens wear was terminated in only two cases: one case of increased corneal vascularization beyond the limbus, and one case of significant corneal infiltrate. In the latter, the subject failed to return for follow-up visits until he experienced "blurred vision" in his right eye. Examination revealed a central corneal infiltrate approximately 5 mm in diameter extending from the epithelium through half the stroma thickness. Complete cessation of lens wear resulted in total remission of the infiltrate over a two month time period.

Corneal infiltrates are frequently found in soft lens wearers (18) and may or may not be associated with bacterial or viral corneal inflammations. The infiltrates are usually found as a band in the limbal area or as focal spots in the central cornea (16). In the absence of conjunctival hyperemia or visual disturbance, the contact lens wearer is usually totally unaware of the infiltrate. Thimerosal solution sensitivity has been implicated as one cause of the infiltrates. Cessation of lens wear without medication eventually leads to resolution of the infiltrates although it may take weeks or months.

The incidence of complications from contact lenses during this study contrasts with the results of previous studies. Numerous cases of severe ocular infection have been reported in the ophthalmic literature, and many of them requiring hospitalization, and some resulting in partial loss of vision. Yet no incidents were reported requiring medical treatment in this study.

One can only speculate why no medical eye problems occurred. There are two possible reasons. One is the degree of patient education and adherence to instructions. Military officers and nuclear trained personnel serving on submarines "do it by the book"; that is, they follow procedures exactly. They return as directed for follow-up

examinations, and remove their lenses when they experience red eyes, blurred vision, or ocular irritation. They do not attempt to wear their lenses when they are not completely satisfactory.

The second reason is simply the close follow-up care provided in this study.

Additionally, many of these problems or complications associated with lens wear should decrease or be eliminated with improvements in contact lens technology and improved fitting techniques.

Dealing with Complications

Although complications from contact lenses during this study were infrequent, they do remain a potential problem.

A number of steps are being taken to deal with complications from soft contact lens wear. The primary recommendation is that hospital corpsmen serving aboard submarines and undersea medical officers be trained to handle acute contact lens problems. This is already being incorporated into the curricula at the Naval Undersea Medical Institute and has been carried out for the past two years on a lecture basis to both groups as well as recently to all submarine hospital corpsmen undergoing refresher training at the Naval Undersea Medical Institute.

It is expected that most of the acute problems will be readily detected by the educated contact lens wearer and can be dealt with by the corpsman aboard the submarine. The subacute or chronic contact lens complications will, in all likelihood not be seen or recognized by either the contact lens wearer or the corpsman because the physiological changes are microscopic. Of prime concern would be corneal neovascularization, a condition where new blood vessels grow into the avascular structure of the cornea from the limbus. This can be monitored only with a slit-lamp examination (or biomicroscopy of the cornea). Another condition requiring the use of the biomicroscope for diagnosis is that of corneal infiltrates. Changes in the structure of the corneal endothelium such as striae and folds are also detectable only with high magnification. It is recommended that a recall system be established. Follow-up visits for adapted extended wear contact lens wearers should be at intervals no greater than six months, and prior to extended deployments.

Possibly the major potential area which can lead to contact lens associated problems is that of the fully adjusted long term wearer who has become blase' about the wearing of his lenses. He refuses to acknowledge subacute problems such as redness of the eyes, ocular irritation, or

blurring of vision. It is only when the symptoms cause acute distress that he takes corrective action or seeks professional advice. Management of this situation can only be accomplished through continuing patient education.

Contact lens wearers should also be aware of the problem of lens contamination with scopolamine. The motion sickness medication containing scopolamine is available as part of the authorized medical allowance (AMAL) on the submarines. Contact lens wearers who use this medication which is applied as a patch behind the ear and enters the blood system transdermally, should be aware that residual scopolamine left on the hands after applying the patch could be transferred to the contact lens if the lens is handled shortly after applying the patch. A contaminated lens can then transfer the scopolamine to the eye resulting in pupillary dilation and paralysis of accommodation.

Care Regimens

A number of different care regimens were used during the study. The extended wear patients were, for the most part, maintained on chemical or cold disinfection regimens. These were of two main types, the chlorhexidine and alkyl triethanol ammonium chloride, both preserved with thimerosal. For those wearers who demonstrate a sensitivity to either the disinfecting agent or the preservative, the only alternative available cold disinfection routine is the use of hydrogen peroxide. For those contact lens wearers who are on extended wear and do not need to remove their lenses except to clean them, it has been found that they do best when cleaning their lenses using cleaners that do not utilize a preservative and then rinse their lenses with an unpreserved saline solution.

Future Lens Developments

Hydrophilic contact lenses are loosely categorized as low, medium, and high water content. While this study has used only bufilcon A (medium water) and perfilcon A (high water) due to their availablity at the time the study was initiated, the investigator cannot rule out other materials approved by the Food and Drug Administration for extended wear as being suitable for use on Navy submarines. The particular effects of the submarine environment on new materials is unknown although problems are not anticipated. It is generally regarded in the ophthalmic field that no one type of contact lens will be satisfactory for all patients. A lens type which is highly satisfactory on one patient may be completely unsatisfactory on another. Future lens development may require additional study.

RECOMMENDATIONS

Extended wear contact lenses have been shown to be safe for use on submarines for extended periods of time, and to provide improved visual performance to periscope operators as well as to those submariners who must use a visual correction while wearing the emergency breathing apparatus.

Consideration can now be given to bringing spherical refractive error standards for nuclear power officers serving on submarines in line with the unrestricted line surface vision standards. Until soft extended wear contact lenses can be successfully fit on astigmatic eyes in higher powers and at the full range of axes, the limitation on cylindrical errors current at 2.00 diopters should remain unchanged.

Finally, a back-up system to the contact lenses should be available in the event that a man loses or tears his lenses or is not able to wear his contact lenses while on operations.

REFERENCES

1. Manual of the Medical Department, Chapter 15-29 Submarine Personnel Para (2)(b)(1).

2. Kinney, J.A.S., Luria, S.M., McKay, C.L., and Ryan, A.P. Vision of submariners. Undersea Biomed. Res. Sub. Suppl.: S163-S173, 1979.

3. Kinney, J.A.S., Luria, S.M., Ryan, A.P., Schlichting, C.L., and Paulson, H.M. The vision of submariners and National Guardsmen: a longitudinal study. NSMRL Rep. No. 918, 1980.

4. Socks, J.F. and Luria, S.M. Improvement of vision through the periscope, background and proposed solutions. NSMRL Rep. No. 1026, 1984.

5. Peters, H.B. Relationship between refractive error and uncorrected visual acuity. Am. J. Optom. Physiol. Optics 38, 194-198, 1961.

6. Naval Recruiting Command ltr CNRC/211/daj, 600, Ser 4336 of 29 Aug 1980.

7. Luria, S.M., Kinney, Jo Ann S. A simple device for adding optical corrections to periscopes. NSMRL Rep. No. 927, 1980.

8. CNO ltr Ser 290/386746 of 13 Feb 1981.

9. OP-093A memo Ser 093A/200182 of 24 Apr 1979.

10. Hart, D.E. Lipid deposits which form on extended wear contact lenses. Int. Contact Lens Clin. 11(6): 348-362, 1984.

11. Davis, R.L. Animal versus plant enzyme. Int. Contact Lens Clin. 10(5): 277-285, 1983.

12. Luria, S.M., Dougherty, J.H. Jr. Leakage into the navy oxygen breathing apparatus when worn over spectacles. NSMRL Rep. No. 1029, 1984.

13. Luria, S.M., Dougherty, J.H. Jr. Effectiveness of the Mark V chemical-biological mask worn over spectacles. NSMRL Rep. No. 1006, 1983.

14. Snyder, AC, and Nash, RW. Do asymptomatic soft contact lens patients require fluorescein evaluations during adaptation? Int. Contact Lens Clin. 1984, 11(11): 691-697.

15. Gero, George. Superficial Punctate Keratitis with CSI Contact Lenses dispensed with the Allergan Hydrocare Cold Kit. Int. Contact Lens Clin. 1984, 11(11): 674-677.

16. Zantos, SG. Management of corneal infiltrates in extended-wear contact lens patients. Int. Contact Lens Clin. 1984, 11(10): 604-612.

17. Paugh, JR, Caywood, TG, and Peterson, SD. toxic Reactions Associated with Chemical Disinfection of Soft contact lenses. Int. Contact Lens Clin. 1984, 11(11): 680-690.

18. Falasca, NA, Panariello, G. Corneal infiltrates induced by contact lens wear. Int. Contact Lens Clin. 1981, 8(4): 28-32.

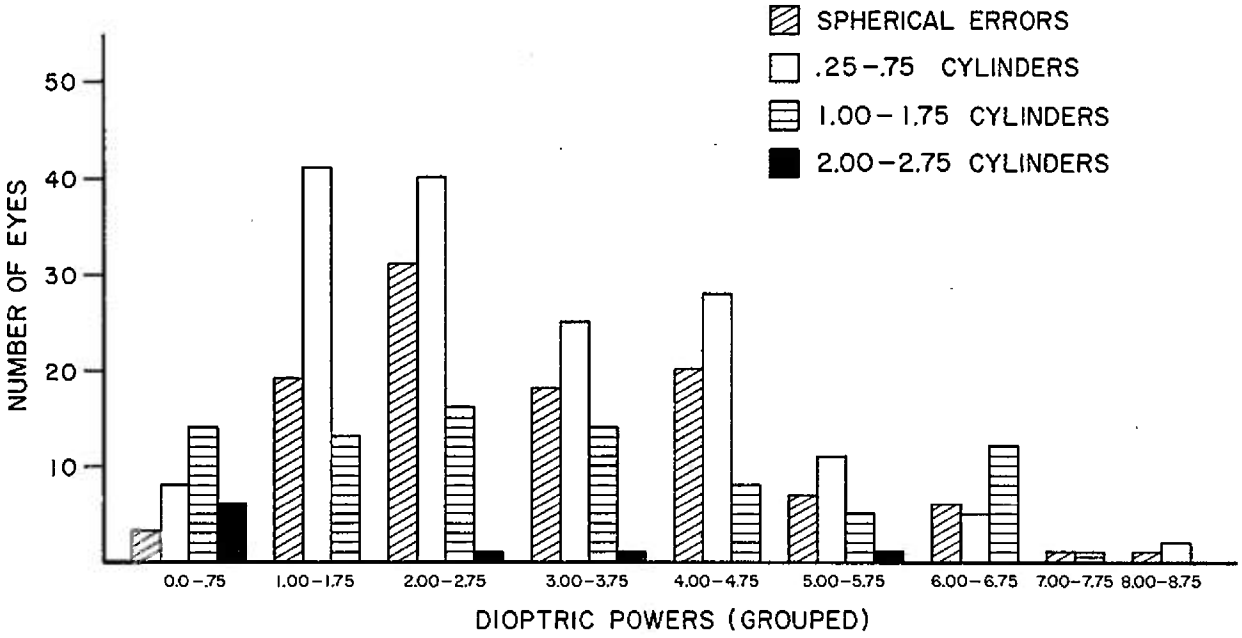

Figure 1. The distribution of spectacle corrections among the submariners

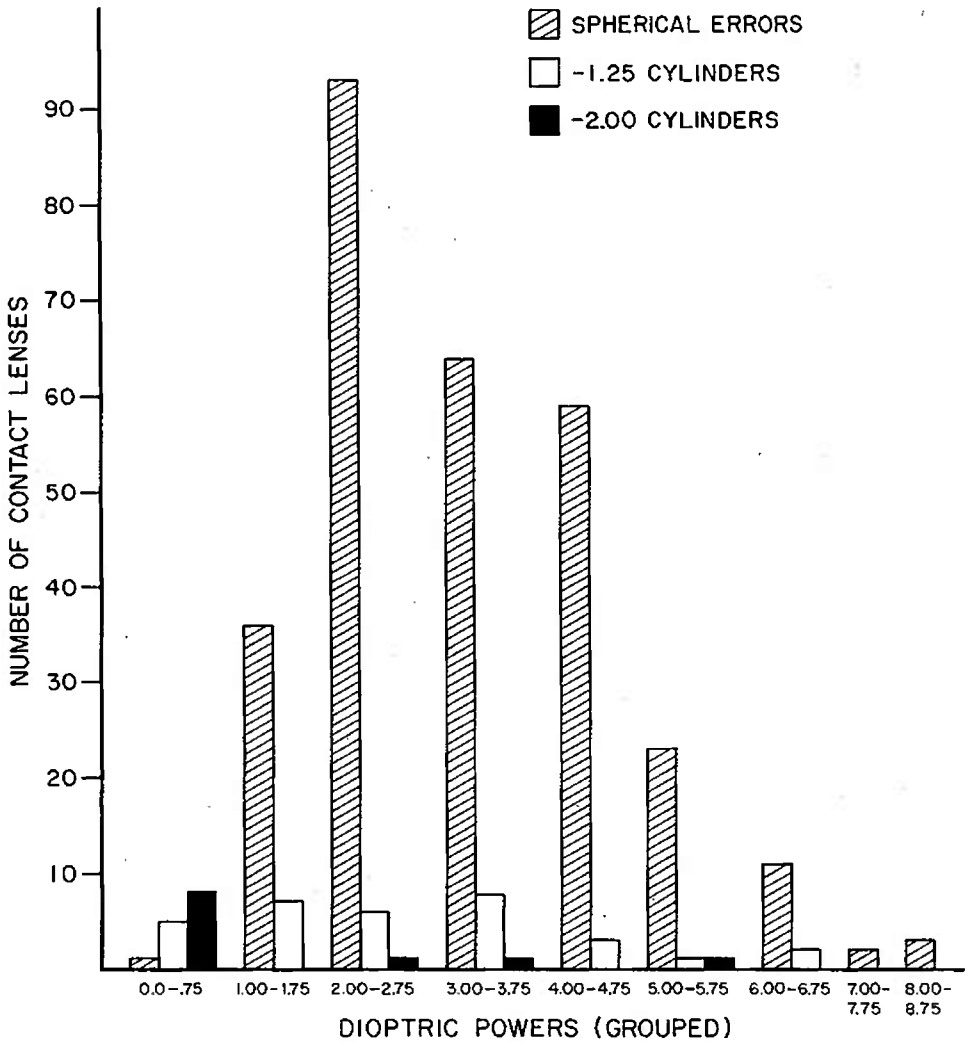

Figure 2. Distribution of contact lens corrections

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In order to determine the feasibility of using contact lenses to correct the refractive errors of periscope operators, 174 operators (154 officers and 20 enlisted men) were fitted with contact lenses and their acceptability aboard submarines monitored. Extended wear contact lenses were shown to be safe for use on submarines for long periods of time and to provide improved visual performance. Corneal complications were usually minor and transitory. They included striae, infiltrates, epithelial staining and pits, and neovascularization.

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