Recent Topics in Ophthalmological Practice in Japan


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According to the Tajimi Study, an epidemiologic study carried out in Tajimi, Gifu Prefecture in Japan, from 2000 to 2001, the prevalence rates of blindness and low vision as determined by WHO criteria were 0.14% and 0.39%, respectively, among people aged 40 years or older.1 These figures were lower than the corresponding rates obtained by epidemiologic studies in Los Angeles (0.2% and 0.7%) and Tanjjang Pagar, Singapore (0.5% and 1.1%). Reports from various parts of the world also indicate that the prevalence of visual disturbances in Japan remains among the lowest. The following factors may contribute to the low prevalence in Japan: increased national attention to the treatment of ophthalmologic diseases in concert with the rapidly growing economy following World War II, and the spread of medical services under the universal health insurance coverage available in this country. The causes of blindness include optic nerve atrophy, myopic macular degeneration, pigmented degeneration of the retina, and uveitis, while cataract and glaucoma are major causes of low vision.1 According to the 2006 report by the Research Group of the Ministry of Health, Labor and Welfare, visually impaired people, as determined by applications for a physical disability certificate, totaled about 390,000 individuals, with the most frequent cause being glaucoma (20.7%), followed by diabetic retinopathy (19%), pigmented degeneration of the retina (13.7%), age-related macular degeneration (9.1%), and high myopia (7.8%).

Epidemiologic data on glaucoma from the Tajimi Study showed that the prevalence of glaucoma in Japan was higher than in previous reports, with the figures being 5.0% for established glaucoma and 7.5% for established or suspected glaucoma among those in their 40s or older.2 In terms of the type of glaucoma, primary open-angle glaucoma (POAG) accounted for almost 80% of all glaucoma cases (3.9% as a whole); other cases were primary angle-closure glaucoma (0.6%) and secondary glaucoma (0.5%). A comparison with reported rates of prevalence in various countries showed that these rates were higher than those in Caucasians but slightly lower than those in blacks. It is noteworthy that about 92% of POAG patients had normal-tension glaucoma (NTG) with an intraocular pressure (IOP) of 21 mmHg or lower. The mean IOP (right eye) in POAG was 15.4 mmHg. Although this was significantly higher than the mean IOP (right eye) of 14.5 mmHg in non-glaucoma eyes, the distribution of IOP was similar in POAG eyes and non-glaucoma eyes. A peculiar feature of glaucoma in Japan was that the proportion of NTG in POAG cases in this study was higher than in any previous study. However, the proportion of NTG tends to be increasing throughout the world as a result of changes in the definition of glaucoma and advances in diagnostic techniques. Newly diagnosed glaucoma accounted for about 90% in this study, which limited the significance of IOP in the detection of glaucoma and indicated the importance of funduscopic examination. A multivariate logistic analysis showed that IOP, age, and myopic degree were risk factors for POAG. The odds ratio was 1.12 for a 1-mmHg increase in IOP, 1.06 for a 1-year increase in age, 1.85 for low myopia, and 2.60 for moderate or higher myopia.3

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Optical fundus image analysis by optical coherence tomography or confocal laser scanning is used widely for the diagnosis of glaucoma and macular diseases. In recent years, Fourier-domain optical coherence tomography (FD-OCT), which has higher resolution than conventional time-domain optical coherence tomography (TD-OCT), has come into practical use. FD-OCT requires no mechanical scanning in the depth direction, but can compose two-dimensional tomographic images by transverse scanning alone, allowing rapid scans. This has reduced motion artifacts and helped provide precise three-dimensional morphologic information about the optic disk and macular area. FD-OCT allows us to distinguish the external limiting membrane in the macular area, which could not be visualized by the conventional procedure. Observation of the macular hole by FD-OCT has demonstrated round disruption of the external limiting membrane in Stage 1, adding a new finding to the mechanisms of macular hole formation. It is expected that visualization of the ganglion cell layer surrounding the macula and observation of the spatial morphology of the lamina cribrosa would result in new progress in glaucoma research.

Exudative age-related macular degeneration (AMD) is the most frequent cause of blindness in the elderly in the United States. Photodynamic therapy (PDT) with verteporfin has been the main treatment for this condition. However, recently, intra-vitreal anti-vascular endothelial growth factor antibody (anti-VEGF antibody) has become common as a result of its high therapeutic efficacy. In recent years, AMD also has become more frequent in Japan. An epidemiologic study in Hisayama revealed that the prevalence was 0.87% among those aged 50 years or older, the incidence rate was 0.8% over a period of 5 years, and the main contributory risk factor was smoking. When AMD cases in Japan were analyzed in detail by indocyanine green angiography, pathologic features different from those found in European and North American cases were found. A study of 289 cases included 35.3% typical AMD, which accounts for the vast majority of cases in Europe and North America, whereas polypoidal choroidal vasculopathy (PCV) was most common (found in 54.7%), and retinal angiomatous proliferation (RAP) was noted in 4.5%. In treating PCV, PDT was found to be more effective than in typical AMD.

Cultured epithelial sheet grafting using corneal epithelial stem cells or oral mucosal epithelial cells was developed as a technique for regenerating the corneal epithelium in corneal stem cell deficiency caused by heat or chemical corrosion, or in cases of Stevens-Johnson syndrome. Formerly, conjunctival transplantation or keratoepithioplasty was employed to restore the corneal epithelium, but it was difficult to achieve permanent reconstruction of the corneal epithelium because of the short turnover time. Later, it was found that corneal epithelial stem cells are located in the limbal epithelium, and production and transplantation of an epithelial sheet obtained from cultured autologous corneal epithelial stem cells solved the existing immunological problems, thus enabling reconstruction of clear epithelium from intractable cicatricial corneal epithelium. The epithelial sheet can be produced by a method using the amniotic membrane as a substrate or a method using a temperature-responsive culture plate. The latter method is advantageous in that a strong cell-adhesion apparatus is maintained because an epithelial sheet can be detached from the culture plate, which has been treated with a temperature-responsive intelligent polymer, without using proteolytic enzymes. In patients with bilateral disease in whom no autologous corneal epithelial stem cells are available, cultures of autologous oral mucosal epithelium have provided favorable results.

Since retinal ganglion cells have no regenerative function, there has been no established treatment for ischemic, compressive, or traumatic optic neuropathy. However, direct electrical stimuli to the rat optic nerve have been found to exert a neuroprotective effect on retinal ganglion cells with broken axons, and it has been demonstrated that trans-corneal electrical stimulation (TES) using a contact electrode also has a neuroprotective effect on retinal ganglion cells. A tendency to improved visual acuity and field of vision has been noted in patients with nonarteritic ischemic or traumatic optic neuropathy who underwent TES with a 600–800 μA of electrical current at 10 ms/phase, 20 Hz, over 30 min. This finding suggests the possibility of the clinical application of this technique in cases of optic neuropathy, for which there has been no established treatment.
References