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**ANALYSIS OF USAGE OF VARIOUS ADHESIVE SYSTEMS AND
BONDING PROTOCOLS BY DENTISTS**

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Resume. This study evaluated the frequency of usage of different adhesive systems and bonding protocols by dentists. In Belarus and Iran, dentists use similar types of adhesive systems with the leading adhesive being Single Bond Universal. 56,0% of Belarusian and 68,0% of Iranian dentists had never used ethanol-wet bonding technique in their practice. 43,0% of Belarusian dentists and 48,4% of Iranian dentists process the tooth cavity with 2% chlorhexidine solution before filling it.

Keywords: adhesive systems, bonding protocols.

Relevance. Numerous studies of the adhesion of composite materials to tooth tissues suggest that despite a wide variety of adhesive systems many unresolved questions still remain. Contemporary commercial adhesives are very hydrophilic and are inclined to increase water sorption and accelerate degradation of the resin–dentine interfaces [1]. Drying acid-etched dentin causes collapse of the collagen network that prevents resin infiltration and decreases dentin bond strength. In the ethanol-wet bonding technique (EWBT), ethanol is used to replace water just prior to bonding, thus avoiding the collapse of the collagen matrix. Ethanol-wet dentine may permit the infiltration of hydrophobic monomers to disperse into the demineralised dentine, creating a hydrophobic hybrid layer. Dentin bonding with hydrophobic resins using the ethanol-wet bonding technique has shown encouraging results in terms of resin–dentin bond stability *in vitro* [2]. So far, to the extent of the authors' knowledge no study has attempted to investigate the EWBT in an *in vivo* setting. It is also unknown how EWBT is common among dental clinicians.

Aim: to compare the ethanol- and water-wet bonding techniques according to a literature data and to determine the frequency of usage of different adhesive systems and bonding protocols by dentists in Iran and Belarus.

Objectives:

1. To analyze literature sources on the problem of ethanol-wet (EWBT) and water-wet bonding (WWBT) techniques.
2. To develop a questionnaire for dentists to determine their usage of various adhesive systems and protocols.
3. To carry out a survey among Iranian and Belarusian dentists.
4. To conduct a comparative analysis of the usage of adhesive techniques based on the answers of respondents.

Materials and methods. Literature sources on the problem of EWBT were analyzed using the databases and search engines Elsevier, Scipers, European Journal of Dentistry and Science Direct. The ethanol- and water-wet techniques were compared by laboratory and clinical findings. They included the effects of these protocols on the coronal and root dentin bond strength, the effect of bonding strength with chlorhexidine adding, microtensile bond strength and nanoleakage of dentin bonded interfaces under clinical and laboratory

conditions. Also, 102 dentists from Belarus and 31 dentists from Iran from governmental and private sectors of dental healthcare systems were surveyed to analyze their usage of adhesive systems and bonding protocols.

Results and discussion. EWBT suggests the idea of replacing water in the demineralized collagen matrix with ethanol. This strategy is thought to increase the bond strength and durability by saving the structure of collagen fibers from collapse, creating conditions for fibers infiltration with a hydrophobic monomer, increasing interfibrillar space, decreasing hydrolysis of hybrid layer and activity of matrix proteinases. The application of EWBT instead of the water protocol is not yet fully defined. EWBT can create similar or higher bond strength with hydrophilic etch-and-rinse adhesives and display enhanced bonding durability under chemical challenge [3]. It was shown in vitro that deploying EWBT can increase the adhesion abilities of commercial adhesives to enamel and have potential benefits on root canal resin–dentin bonding under an appropriate processing time [4]. The addition of 2% chlorhexidine to EWBT did not further improve the bond strength of luting of a fiber post to intraradicular dentin when compared to EWBT alone after 12 months of ageing [5].

According to our survey, in Belarus, most dentists (36,0%) use 5th generation of adhesive systems, 28,0% use self-etching 6th generation and 20,0% use self-etching 7th generation of adhesives. In Iran, most dentists (48,0%) work with 5th generation of adhesive systems, 30,0% – with the 6th generation and 18,0% – with self-etching 7th generation.

The spectrum of adhesive systems used by dentists is shown to be wide (figure 1). Most Belarussian dentists (30,6%) prefer Single Bond Universal, 9,8% – Adper Single Bond 2 and 9,0% – Opti Bond FL. Partially similar, in Iran most dentists (27,5%) use Single Bond Universal, 19,0% work with Tetric N-Bond 2 and 9,0% – with Opti Bond FL.

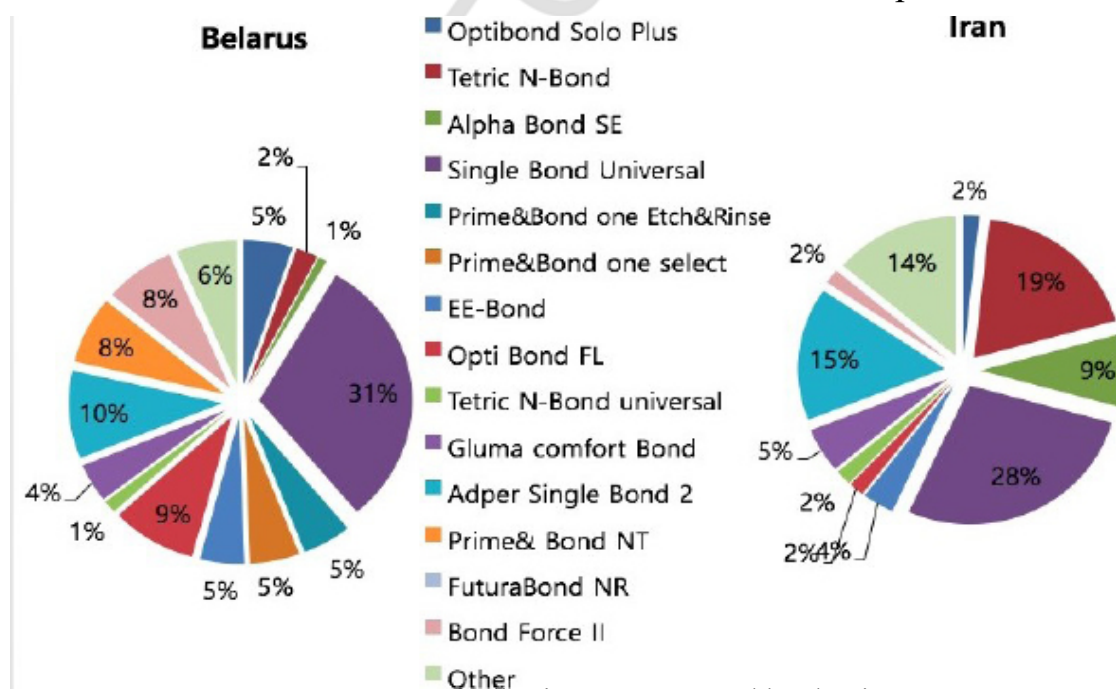


Fig. 1 – Types of adhesive systems used by dentists

Among dentists who were questioned, in Belarus 31,0% don't know which adhesive solvent in the adhesive system they use, 28,0% use acetone-containing adhesives and 17,0%

– alcohol-based. In Iran, 32,0% use acetone adhesive solvent, 30,0% use water-acetone-based and 26,0% use alcohol-containing. 43,0% of Belarusian dentists and 48,4% of Iranian dentists process the tooth cavity with 2% chlorhexidine solution before its filling in order to prevent hybrid layer destruction caused by matrix proteinases.

Dentists in two countries list several complications after using adhesive systems. 52,0% of Belarusian dentists and 41,0% of Iranian dentists stated that the leading complication was postoperative sensitivity. 35,0% of doctors in Belarus and 39,0% doctors in Iran don't have any complications after using adhesive systems.

In general, constant usage of EWBT had been marked by only 5,0% of dentists in Belarus and 7,0% of dentists in Iran. 19,0% of Belarusian dentists and 6,0% of Iranian dentists use both protocols. However, some differences were observed between dentists from different dental service sectors in both countries (figure 2). 49,6% of Belarusian dentists from private clinics and 70,7% from public ones had never used ethanol bonding. At the same time, all dentists from public sector in Iran had never used ethanol bonding, and only 13,3% of private dentists use EWBT in their everyday practice.

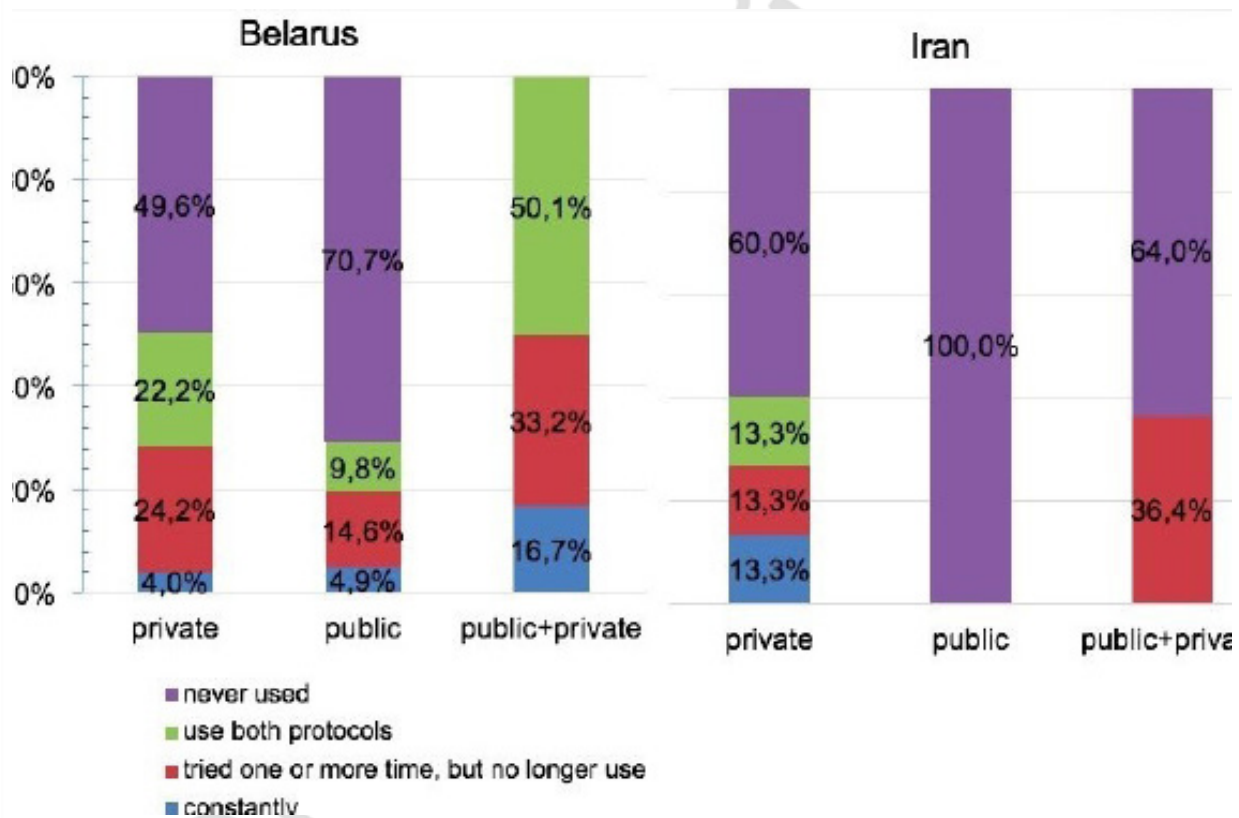


Fig. 2 – Usage of EWBT among dentists from different dental service sectors

According to the surveyed dentists, the advantages of using EWBT are: high quality and durability of restorations, good marginal seal, absence of postoperative sensibility. Among dentists who use EWBT, most doctors prefer the following scheme of ethanol bonding protocol: acid etching of prepared dentine □ rinsing of the etching agent □ application of 96% ethanol solution for 30 seconds □ adhesive application (figure 3).

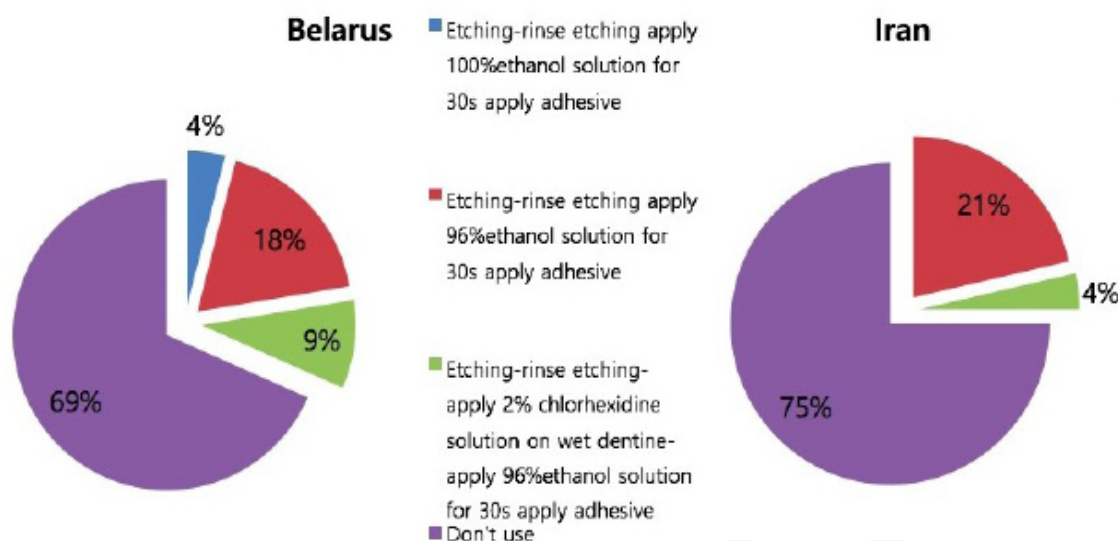


Fig. 3 – Schemes of Ethanol-wet bonding protocol

Conclusions:

- 1 The literature data reveals similar and sometimes controversial results of the effectiveness of ethanol- and water-wet techniques application;
- 2 In Belarus and Iran, dentists use similar types of adhesive systems with the leading adhesive being Single Bond Universal. 31,0% of Belarusian doctors and 12,0% of Iranian doctors don't know a type of solvent in their chosen adhesive;
- 3 56,0% of Belarusian and 68,0% of Iranian dentists don't use EWBT, 19,0% of Belarusian and 6,0% of Iranian doctors use both protocols;
- 4 43,0% of Belarusian dentists and 48,4% of Iranian dentists process the tooth cavity with 2% chlorhexidine solution before its filling;
- 5 The leading complication among all specialists remains postoperative sensitivity;
- 6 Longitudinal clinical evaluation of the EWBT is still unclear.

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