



Aligner Waste - How You Can Avoid It

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Abstract

This article reports on our experiences with aligner waste, the associated waste generation and what orthodontists can do about it in practice. It is an appeal to all orthodontists and aligner providers to take a sustainable approach to aligner treatment. We share our ideas and tips on how you too can avoid wasting unnecessary resources in everyday practice and when ordering aligners.

Keywords:

Aligner waste / sustainability / avoiding refinements / greenwashing / aligner industry

Introduction

Orthodontics with clear aligners has fundamentally changed our profession. With the introduction of the Invisalign® system in the late 1990s, Align Technology pioneered the orthodontic market and ushered in digital, transparent and removable orthodontics with their product [1].

If you are an orthodontist & aligner provider, you have probably already experienced the many benefits of aligners for you and your patients. But you've probably also learned about some of the disadvantages, such as the fact that success depends on patient cooperation, the lack of control over certain movements and the numerous refinements [3,5-9,10,12].

Currently, the major aligner companies offer a similar ordering process for their customers: they will send you as many aligners as you want. If needed, you can order unlimited more, as long as you request them within a certain period of time.

This approach is in the best interest of both the patient and the doctor, as doctors can guarantee successful treatment for their patients regardless of the number of aligners, and there are no further high costs for patients.

An example of waste

In a complex case where we are planning a 50% distalization, for example, we receive about 80 aligners at once.

However, if we realize after 30 aligners that the aligners do not fit and the planning does not work as intended, we have to interrupt the treatment and order new aligners.

Unfortunately, it is not always possible to predict these undesirable situations. However, as several factors play a role, we encounter this problem relatively frequently in everyday practice.

In the example above, the interruption of the planned course may be due to the molars not being sufficiently distalized, the clinical crowns may be too short, the bone may be too mineralized, there may be microcollisions between the teeth or the patient may have lost motivation and is not wearing the aligners sufficiently.

Whatever the reason, the planning and treatment are not working and it therefore makes no sense to continue with the aligners that have already been ordered. So we change the planning. New aligners are ordered and 50 unused aligners are thrown away. This means that more aligners are thrown away than the patient has received.

This method of producing more aligners than necessary not only contradicts today's sustainability approach in the context of the environmental crisis and climate change, but also has some disadvantages for patient motivation and confidence. So does it really make sense to have all the aligners made at once? In this example, the patient hasn't even seen the 50 custom-made aligners yet!

Has something similar happened to you? This situation probably sounds familiar to you, because in our many years of experience as aligner users, this has happened to us many times. Everyone who treats complex cases with aligners sometimes throws away unused aligners. However, some practitioners pay no attention to this. And that's where the problem lies.

Being sustainable with aligners?

Seven years ago, one of our patients told us how much she valued her aligner treatment, but how much waste was produced. Especially when a large number of unused aligners end up in the trash. After hearing this, we didn't know what to say to her at first. Because we had never thought about it before this conversation. We care about nature, pollution and climate change, we use refillable bottles and a reusable bag. And suddenly it was made clear to us at that moment how many unused aligners are

wasted in practice.

So we started with our own strategy, which we called "divide and conquer". In this strategy, we order the aligners in 2 phases: Instead of approving a simulation with over 90 aligners, we initially request only the first 30 aligners. This allows us to see how well the planning works and whether the patient cooperates. If it turns out after the first 30 aligners that everything is working according to plan, the remaining aligners can be requested without having to prepare and submit new documents (photos, scans, impressions).

We have been working according to this strategy since 2015 and have passed this advice on to everyone we have been able to reach.

Advantages of Less Aligners

Apart from reducing the environmental impact of our daily work with aligners, the "divide and conquer" strategy has several advantages for you and the patient:

Patients perceive aligners as high-tech appliances that are customized and high quality. Therefore, patients don't really understand that unused aligners are thrown away during treatment simply because the teeth are not moving as planned. So if you don't order all the aligners at once, you don't have to convince your patient to interrupt the treatment, make them wait until the new aligners arrive and throw away the remaining unused aligners. If you order the aligners in two phases, you can adjust the treatment schedule more easily. You also don't have to have an awkward conversation with your patient about why the treatment plan isn't working without having to explain terms and concepts like "biological boundaries" or "anchorage". You also need less space in the practice to store the treatment boxes. Why would you want to store aligners that your patient won't be wearing for a year or even longer? Does your practice have this capacity?

This strategy also benefits your patients, because it is different for them to receive 45 aligners first and then 25 more aligners at once instead of 70.

And of course, if you care about the environment, this way of working has a much greater impact on

resource waste than using your reusable bag or reusable bottle.

Aligner manufacturers should encourage orthodontists not to order all aligners at once. The manufacturers themselves also save on production. After all, it is not just the aligner plastic and packaging that we waste, but all production waste in the manufacturing process, as a printed model has to be created for each aligner. The transportation and energy required to dispose of the aligners at the end also contribute to this. The waste of resources can no longer be overlooked in 2022. So why should a company overproduce and generate waste?

According to the scientific literature and our own experience, there are several situations in which we waste aligners. This is our list of the "Top 10 Wastes":

1. large sequential movements such as distalization of more than 3 mm
2. extrusion of the canines or posterior teeth
3. difficult derotations (lower premolars)
4. uprighting of the molars
5. poor compliance
6. excessive overcorrection
7. tooth eruption in children
8. clinically short crowns
9. emergency dental treatment during aligner treatment
10. production defects

TAKE HOME: How can you avoid unnecessary refinements?

1 - Ask your patient to keep all the used aligners! If he has not worn them enough, he can go back and wear some aligners again properly. Let your patient change the aligners every seven days only if they have proven to you that they wear them 20 hours a day - if not, let them change every 10-14 days.

2 - Be realistic about planned movements. Use non-compliance aids such as partial arches and TADs to achieve predictable movements (see Fig. 1-3). Perform pre-treatments and shorten treatment time with aligners. No one wants to wear over 100 aligners.



Fig. 1: Tooth 35 does not fit well with the aligners



Fig. 2: Fit problems in region 35



Fig. 3: Fixing braces of tooth 36-34 to straighten tooth 35 more quickly

3 - Be careful with overcorrection. Some overcorrection is recommended, but don't think that the more overcorrections you make, the better the result.

4 - Prioritize your goals. Schedule long treatments and ask for an appropriate number of aligners.

5 - Don't start the case with erupting canines or premolars. It seems obvious, but sometimes doctors get impatient to start treatment.

6 - Spend time analyzing your old ClinChecks/simulations to avoid making the same mistakes over and over again.



Fig. 4: Example of a hybrid treatment: Aligner therapy with a Bene slider for distalization to avoid an unnecessary number of aligners. The patient wears the aligners up to the maxillary premolars

(tooth 25, 35).

Align Technology and its main competitors claim to be committed to sustainability. Align Technology has even taken measures to promote the recycling of aligners [2,6,10]. Recycling is a good approach, but currently with little effect. It is more of a "greenwashing" than a problem-solving method, as you cannot use recycled materials to make aligners. The aligners themselves cannot be recycled into other aligners, so there will never be a circular system [8,11]. The aligners, the packaging and their production waste can be downcycled in this case.

Von Bremen et al. asked 32 aligner companies about their production, recycling and sustainability efforts [13]. Only 8 out of 32 companies responded to the survey. Two of the companies stated that they recycle the printed dental arches, five send the dental arches to the practitioner and one manufacturer stated that they let the practitioner decide whether they wanted the dental arches, otherwise they would be disposed of. Four of the companies stated that they were researching biodegradable materials for 3D printing and aligner production. One manufacturer even reported ongoing research projects on direct aligner printing.

Communication and innovation

Aligner companies should talk openly about this issue and create transparency for the user. Awareness of the problem should be raised. One approach would be to show users the option that it is not necessary to order all aligners at once for complex treatments. In addition to production and overproduction, the packaging in which the aligners are supplied could also be reduced [8].

We do not want to condemn the aligner industry, as aligners represent a turning point for us in orthodontics, are an innovation and define our working lives. We just want the aligner industry to see this problem as an opportunity to improve and set an example for other industries. But also the aligner users should take off the "rose-colored glasses" and put on the "green glasses". Let's start the discussion and work together to find the solutions we need to achieve the global goals that the Fridays for Future generation deserves.







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