

PROSTHETIC RECONSTRUCTION OF THE EDENTULOUS MAXILLA

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KEY WORDS

Implant
Prosthetics
Atrophic maxilla
Transfer technique
Efficient

Presurgical planning for the treatment of the maxillary edentulous patient is followed with an entire step-by-step construction of the maxillary prosthesis. I emphasize prosthetic try-ins that ensure proper abutment placement to maximize superior aesthetics and occlusion. Techniques demonstrated will reduce both chair time and stress to the dentist and patient. Also, proper coordination with the laboratory technician frees the doctor from doing time-consuming procedures intraorally. A temporary prosthesis is constructed and used as a guide for the final prosthesis. The efficiency of the following indirect technique allows this service to reach a greater number of patients.

INTRODUCTION

An organized approach for the prosthetic reconstruction of the patient who has had moderate to advanced bone loss in the edentulous maxilla is essential. Before implant surgery, a careful diagnosis is required to formulate a sound treatment plan, since construction of the prosthesis in terms of aesthetics and function will differ in many ways from a traditional restoration.

Informed consent procedures are used to explain these differences to the patient before therapy begins.

MATERIALS AND METHODS

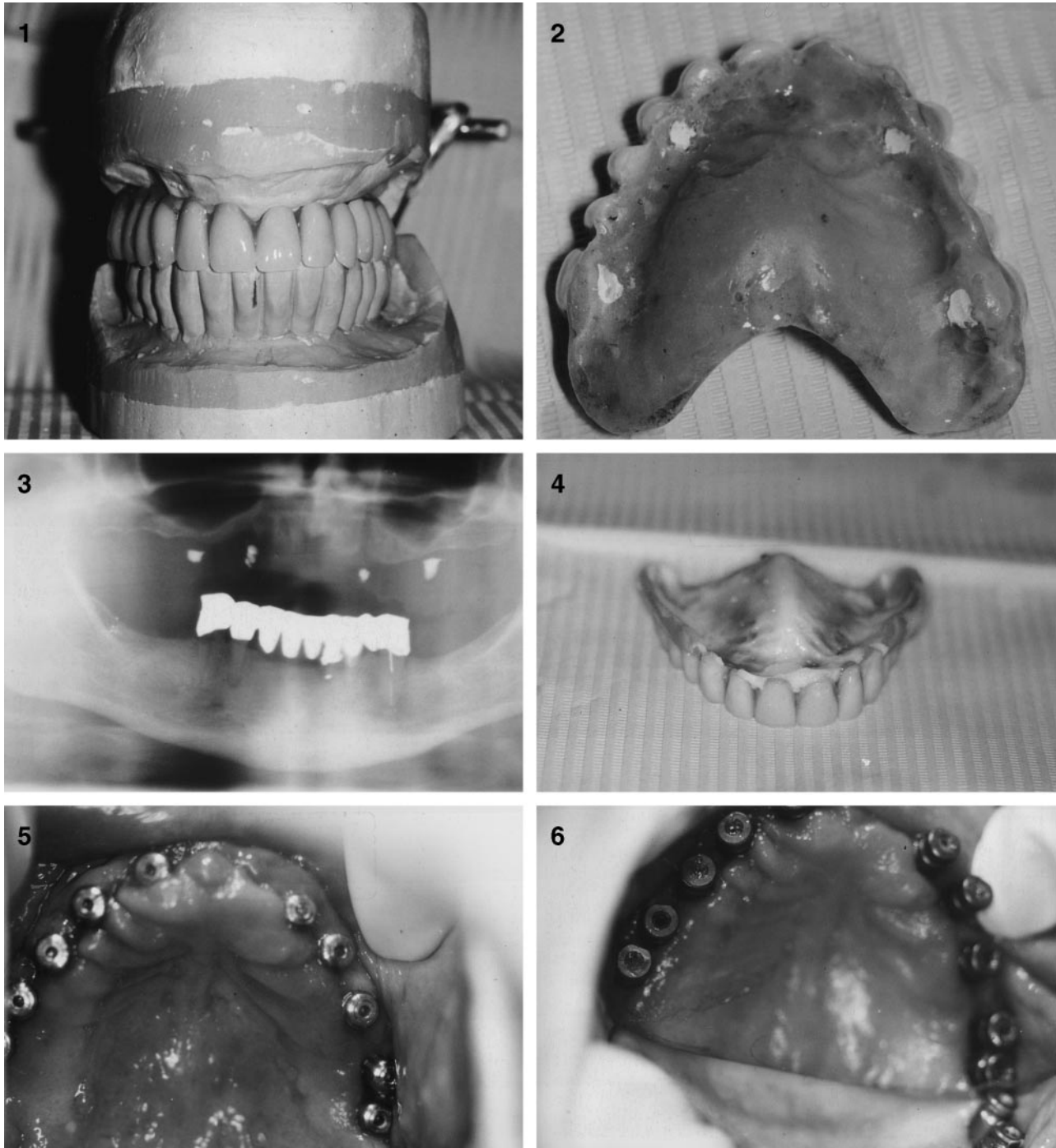
Clinical examination

Initially, thorough patient medical history,^{1,2} dental history, psychological profile, and expectations of therapy should be obtained or determined. Since reconstruction requires a major commitment on the part of the patient, some may be better served with a more

conservative treatment. However, there is no more gratifying experience for a patient than having his or her mouth restored with a fixed appliance.^{3,4} For optimum aesthetics in the final restoration examination of the face, it is necessary to plan the tooth morphology and positioning. The facial proportions, lip support, and smile line will influence the final prosthesis.⁵ The size and strength of the muscles of mastication, which can be approximated by visual inspection, will help the clinician determine the chewing forces generated by the patient. The amount of implant support needed by the prosthesis can then be better determined.⁶

The visual inspection of the edentulous ridge should include an assessment of the height and width of the remaining residual ridge. Edematous tissue, fistulas, and pathological tissue must also be noted. Palpation of the ridge reveals undercut areas and sharp, bony projections.⁷

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FIGURES 1-6. FIGURE 1. Set-up with no labial flange. There is a full palate and the teeth are set to the ridge. FIGURE 2. Radiographic stent. The tissue side is marked with a radio-opaque material in the canine and first molar areas. FIGURE 3. Panoramic radiograph reveals insufficient submental bone height for implant placement. FIGURE 4. Flangeless temporary denture lined with tissue conditioner. FIGURE 5. Healing caps in position. FIGURE 6. Transfer posts in position.

Impressions and occlusal records are taken. A set-up is constructed without a labial flange, giving some idea of the resulting lip support and aesthetics of the final prosthesis⁸ (Fig 1).

Radiological examination

A radiological stent is constructed by duplicating the processed trial set-up. Radio-opaque markers are placed in

the canine and first molar positions on the tissue side of the stent; Caviti or any product that has barium embedded in it will suffice⁹ (Fig 2). The panoramic X ray will reveal the length of bone be-

TABLE 1
Implant placement table

Tooth Site No.	CT Scan Slice No.	Bone Height and Diameter	Implant Type	Implant Length and Diameter	Alternate Length and Diameter	Special Instructions*

*Here, place information about the graft necessary, sinus augmentation, immediate placement or loading, etc.

neath the maxillary sinus and the approximate height of bone in the pre-maxilla¹⁰ (Fig 3). The computerized tomography (CT) scan will give a more accurate measurement of the maxilla. The patient should wear the radiological stent during radiological studies.

Determination is then made as to whether the patient will require grafting to augment the anterior or posterior maxilla. These grafts may be either sinus augmentation, onlay grafts from the symphysis of the mandible or ramous of the mandible, or particulate grafts.^{11,12} Additionally, in the advanced atrophic maxilla, an extraoral graft from the iliac crest may be necessary to harvest a sufficient amount of bone.^{13,14}

Informed consent

The patient must be aware that the final prosthesis will afford the same lip support as the trial set-up without a labial flange. The teeth will be longer and more contoured than the natural teeth were because of the resorption of the residual ridge. This is usually of small consequence with patients having a low lip line.

The patient should be aware that there is always the risk that the prosthesis will break. It is the patient's responsibility to keep the models and temporaries to facilitate repairs.

Surgical stent

The radiological stent can be converted into a surgical stent by grinding away plastic in the areas where the implants are to be placed, leaving a guide for proper implant placement. When the stent is placed in the patient's mouth, it should be designed so it will not get in the way of the labial flap during surgery.¹⁵ It is advisable to overengineer the case and place the maximum number of implants in order to get maximum support and to allow for the fact that all the implants may not integrate in the bone.

Temporization

A complete maxillary denture is constructed and may be relieved to reduce pressure on the surgical site.^{16,17} If the patient has had grafting performed, the denture is constructed without a labial flange. The relieved areas can be filled after surgery with a tissue-conditioning material (Fig 4).

Implant surgery

The approximate size, number, and position of the implants should be determined before surgery.¹⁸ The implant placement table (Table 1) provides guidance for proper implant and site selection. The tooth positions will refer to specific slice numbers on the CT scan and to markings on the surgical

stent. These positions are marked with particular implant sizes. The patient should be told that the final determination of the number of implants placed would be made at the time of surgery.

Second-stage surgery

The second-stage surgery should be performed to maximize attached keratinized gingiva around the abutments. The healing abutments are placed supragingivally to permit healing of the gingiva (Fig 5).

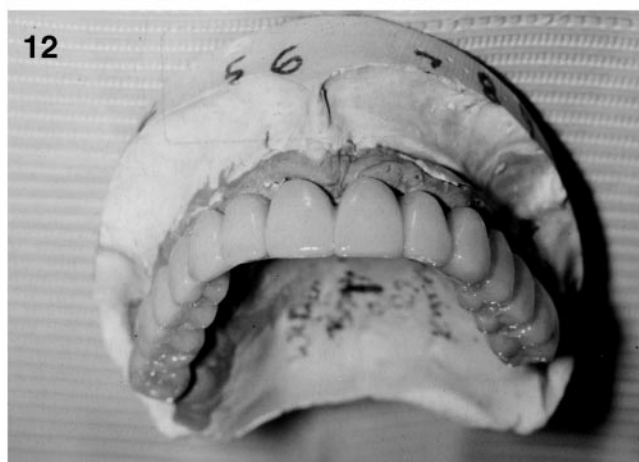
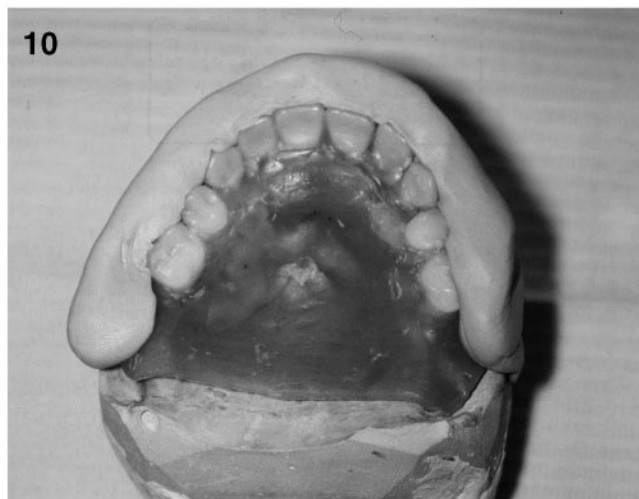
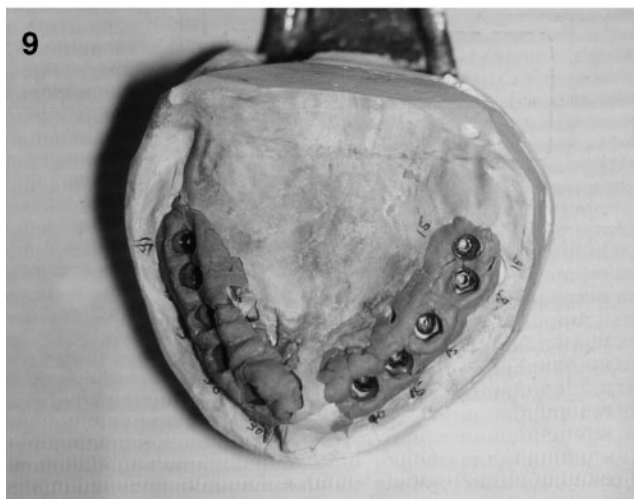
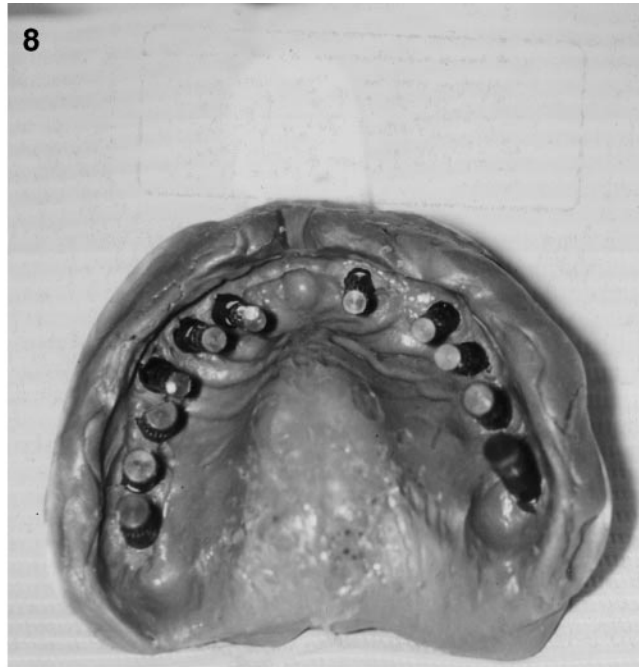
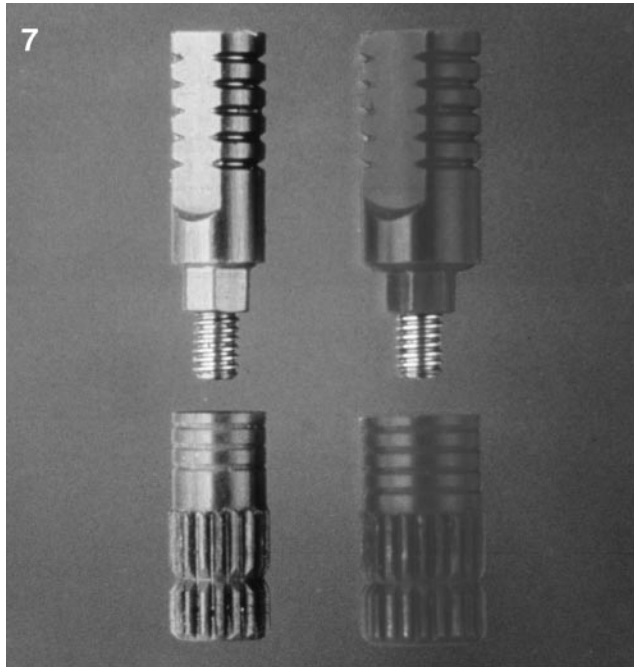
Postsurgical prosthetics

It is advisable to work indirectly on the construction and alignment of the abutments for the following reasons: this technique will reduce overall chair time for the dentist; there is less strain on the patient; there is less strain on the dentist; and it is more likely the abutments will be in optimum position for parallelism, aesthetics, and occlusion.

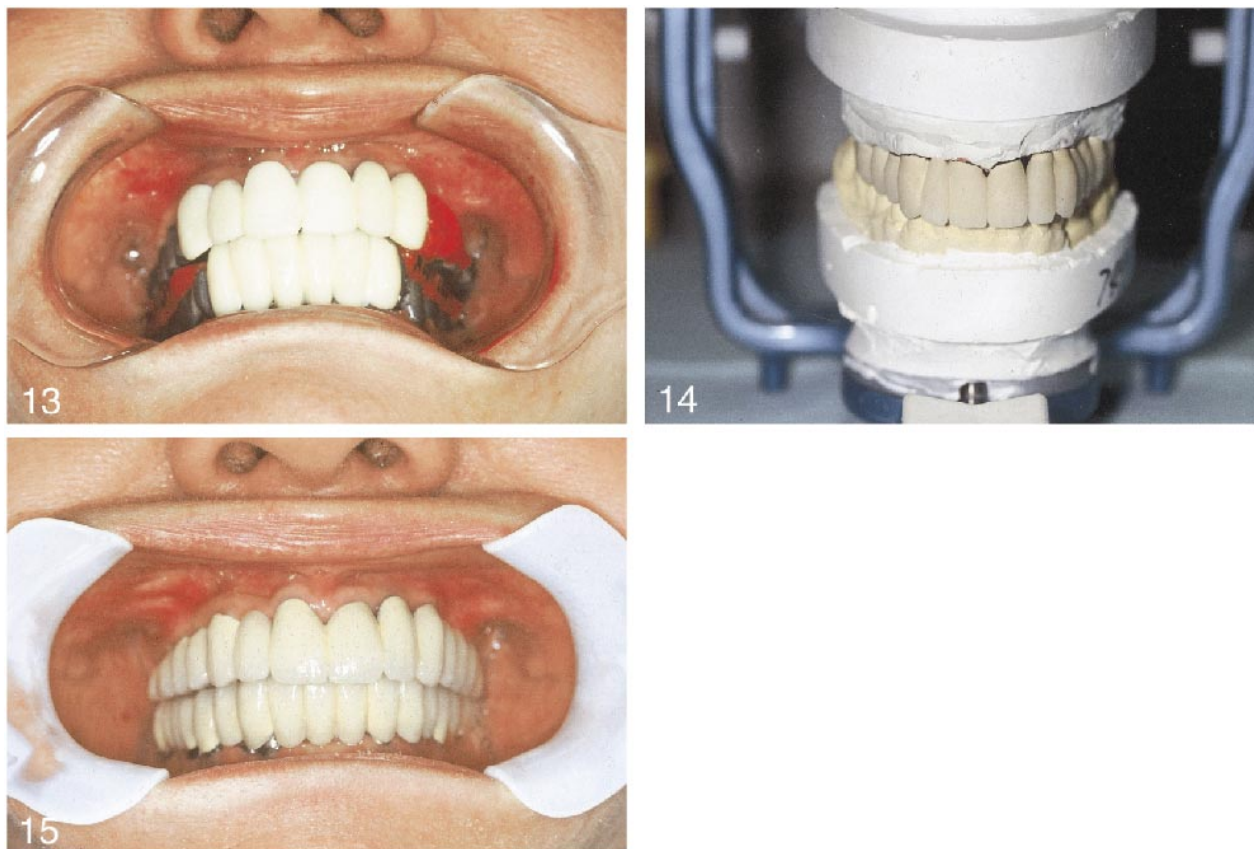
Impressions

A stock tray can be used since the prosthesis will be fixed, and accurate registering of the mucobuccal fold is not necessary. The healing abutments are removed and lined up in the order they were removed.

Transfer posts of the same diameter as the implant head are attached to the



FIGURES 7-12. FIGURE 7. The transfer posts are attached to the implant analogs. FIGURE 8. The transfers are then placed back in the impression. FIGURE 9. Soft tissue model. FIGURE 10. Index of the set-up. FIGURE 11. Face bow transfer and jaw relations. FIGURE 12. Processed temporaries on the model.



FIGURES 13–15. FIGURE 13. Metal frame and wax try-in. FIGURE 14. Bisque try-in. FIGURE 15. Cemented final prosthesis.

implants. Care should be taken that the hex of the transfer is aligned with the flat side of the impression of the transfer. The transfers are then placed back in the impression (Fig 8).

A soft tissue model is then constructed (Fig 9). This is made with approximately half of the implant analog embedded in stone and the coronal half in a flexible material.

Occlusal records

An occlusal bite registration is made. There should be relief in the tray to fit over the healing abutments. This will save time at the bite registration visit. The healing abutments will stabilize the tray. Time is saved by not having to remove the healing abutments and then replacing them.

A face bow transfer is made and centric relation and vertical dimension are recorded. Using generic denture teeth, a set-up is made without a labial flange. This will best simulate the aes-

thetics and lip support of the final prosthesis. There should be relief in the bite block base as well for the healing abutments in the posterior maxilla. The anterior healing abutments will be removed to check aesthetics. If the occlusion and aesthetics are correct, the dentist may next proceed to the making of the abutment posts.

Abutment after construction and temporaries

An index is made of the facial outline of the set-up on the model with a polysiloxane putty (Fig 10). Straight abutments, angled abutments, and custom cast abutments are placed in the soft tissue model.¹⁹ The abutments should:

- Have the proper emergence profile. They should be wider in the posterior sections of the mandible.
- Be of the proper length to allow for vertical dimension and have adequate retention.

A closed-tray impression technique is utilized with a polysiloxane putty and a low-viscosity syringe material. A polyether can also be used. Gingival retraction is not necessary.

After the impression is removed from the patient's mouth, the abutments are removed one by one. They are attached to implant analogs (Fig 7). Care must be taken that all the wax has been removed from the impression and the transfers. The transfers are placed back in the impression. The flat side of

- Be parallel to each other.
- Be within the confines of the set-up index. This will permit proper aesthetics and occlusion.
- Use a subgingival height for the contour for proper aesthetics.
- Be properly marked and indexed to facilitate ease of placement.

Processed temporaries are constructed to evaluate the aesthetics and occlusion.

Inserting abutments

The abutments are inserted into the implants and checked for alignment. A torque wrench at 30 Ncm is used for the final seating of the abutments. Radiographs are taken to verify proper seating of the abutments. The screw holes of the abutments are closed with a soft light-cured acrylic.

Impressions and jaw relations

Impressions are made of the abutments. Face bow and bite registrations are made (Fig 11). The temporaries can be utilized to help establish vertical and centric relations²⁰ (Fig 12). The temporaries are inserted with a noneugenol temporary cement.

Try-in visits

The metal framework is tried in. Appropriate wax (Fig 13) and porcelain bisque try-ins (Fig 14) are performed.^{21,22}

Insertion of the prosthesis

The prosthesis is inserted with retrievable cement²³ (Fig 15). Oral hygiene instructions are given. A package with the temporaries and models is given to the patient. Recall visits are arranged.

RESULTS

The final prosthesis will be very close in appearance to the treatment set-ups. The fixed prosthesis will restore the patient as close as possible to a healthy dentition.

DISCUSSION

This technique allows for a predictable final result. The patient has the oppor-

tunity to visualize what the final result will be, and the treating doctor has the means to produce it. The technique requires knowledge and skill on the part of the operator, but is user-friendly and easily performed. Having the preparations and alignments of the abutments done extraorally by the laboratory technician, under the dentist's guidance, is invaluable. The technician is better able to perform these steps with the use of a surveyor than could be done intraorally. This frees the operator to treat other patients while the technician does much of the construction.

Good informed consent leaves little room for misunderstandings after treatment. These patients will be restored with a Misch/Judy FP2 prosthesis. Because of the bone resorption, the prosthesis will have teeth that are longer and more contoured than their previous natural dentition. Although the patient may ultimately have less lip support than is ideal, when confronted with the option of having a flange to plump them out, the patient will likely select this option.

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