to surrounding structures and salivary glands. This could open the doors to more prosthodontic treatment options for cancer survivors.
- Improvements in implants and flap surgery procedures are leading to quicker and more accurate reconstruction plans, potentially improving prosthodontic rehabilitation prognosis and patient quality of life. The technology is unfortunately still very expensive, preventing these breakthroughs to be dispensed to all affected patients.

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On Protocols for Immediate Implant Placement and Loading: A Synthesis of Relevant University of Genoa Publications and Their Current Clinical Relevance

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- Several implant therapy protocols have been proposed to reconcile immediate loading of the minimum number of implants needed to rehabilitate the already edentulous, or about to be rendered edentulous, maxilla. This presentation reviews salient features of the Columbus Bridge Protocol[1] (Figs 1 and 2) that improve the objective of achieving primary stability and control of occlusal loads, which are both essential if immediate loading is to avoid implant micromotions.
- Implant macrostructure considerations include the use of *(1)* tapered implants when an underpreparation of the implant site is required in order to improve primary stability and *(2)* tilted implants to overcome anatomical limitations (eg, the maxillary sinus) while permitting increased implant length (≥ 13 mm) to obtain primary stability and avoid bone-grafting procedures (Fig 3).[2]
- Tilted implants are regarded as the meeting point between surgical and prosthodontic requirements. Their use ensures wide anteroposterior spread with a favorable occlusal load distribution. Consequently, a well-spread distribution of the implant heads can be obtained with a resultant sufficient recruitment of a reduced number of implants (four to six). The use of tilted distal implants also results in decreased stress values both in peri-implant bone and in the prosthesis framework due to the reduction/elimination of posterior cantilevers.[3]
- Splinting immediately loaded implants with a rigid cast metal framework is also recommended. This provides both biomechanical and esthetic advantages. In fact, to obtain the same resistance with a full acrylic resin prosthesis, a thicker prosthesis is needed. Moreover, aggressive bone remodeling may be required when a reduced prosthodontic space is available. Besides a rigid framework, an acrylic resin occlusal material is suggested in order to reduce occlusal stress due to its shock-absorption capacity.[4]
- A passively fitting prosthesis is obtained in the present protocol with an accurate impression technique (open tray technique with high-retention copings and a very rigid impression material) and with a laboratory luting technique[5] that compensates for possible casting distortion. The immediate loading prosthesis must be screw-retained to readily permit a check of prosthesis fit, avoid undetected loosening, and facilitate an easy repair protocol.
- The proposed protocol has already yielded impressive long-term clinical outcomes.[1] Long, tilted implants placed in pristine bone exhibited predictably excellent results in immediate maxillary loading protocols.[2] However, minor technical complications (ie, chipping of the veneering material) are quite common (Fig 4), and prosthodontic aspects of immediate loading rehabilitations are sadly neglected in the literature.[1,2]

Fig 1 Extraoral and intraoral images of a patient **(a, c)** before and **(b, d)** after rehabilitation following the Columbus Bridge Protocol.

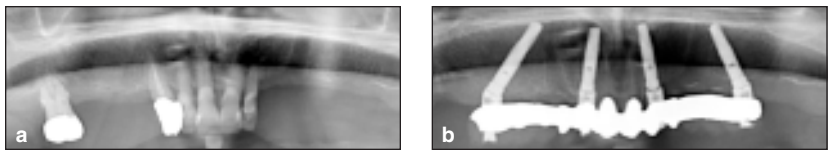

Fig 2 Panoramic radiographs of the same patient in Fig 1 **(a)** before and **(b)** after rehabilitation following the Columbus Bridge Protocol.

Fig 3 *(left)* Intraoperative image shows the insertion of a distal tilted implant bypassing postextractive alveolar sites.

Fig 4 *(right)* Chipping of the veneering material.

- Ongoing studies at the University of Genoa include
  - **Use of carbon fiber frameworks.** Expected advantages are *(1)* optimal mechanical characteristics, *(2)* chemical adhesion to the veneering material (reduced chipping occurrence), *(3)* reduced time of fabrication (avoidance of casting and luting technique), and *(4)* cost reduction.
  - **Digital impression.** In vitro studies have already demonstrated high accuracy of full-arch implant-supported frameworks fabricated on digitally recorded impressions. A clinical protocol is being developed to produce an esthetically and functionally acceptable prosthesis with a rigid metal framework using a digital impression in a short a period of time.

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